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INDEX.

EDITORIAL NOTES.

Abstruse Calculations as to the Non-uniform Rolling of Ships, 2
Accommodation of Fast and Small Passenger Steamers, Improved Speed and, 309
Administration of the Mercantile Marine Fund, 386
Advantages of Liquid Fuel, 471
Allan's Submarine Boat, 345
Annual Dinner of the Institute of Marine Engineers, 137
Annual Meeting of the North-East Coast Institution of Engineers and Shipbuilders, 810
Apprentices and the Board of Trade, 229
Argentine Armoured Torpedo-boat Destroyer "Corrientes," 346
Association of Chambers of Commerce of the United Kingdom at Southampton, 273
Balanced Pressure Valves, 385
Bazin Roller Boat, its Progress, 435
Bazin's, M., new Roller Boat, 229
Belfast, Institution of Mechanical Engineers at, 230
Beresford, Lord Charles, on Navy Reforms, 185
Beresford, Lord Charles, on Watertight Doors, 1
Boats, Their Sizes and Best Method in Placing Them on Board Ship, 346
Brass or Gun Metal v. White Metal, 94
Butcher, Captain M. J., on the Variety of Construction and Fittings of Steamers, 846
Carriage of Grain Cargoes, The, 50
Castle Mail Packets Company's Sad Loss, 137
Causes of Mysterious Fractures in the Steel used by Marine Engineers as Revealed by the Microscope, The, 49
Chemical Estimate of the Salinity of the Condensing Water, 49
Circulation of Water-Tube Boilers, 93
Collapse of the Dispute upon the Clyde, 273
Conditions of Safety now Generally Recognised for Ships, 275
Construction of Watertight Doors, 1
Conversazione of the Institute of Marine Engineers, 348
"Corrientes," Argentine Armoured Torpedo-boat Destroyer, 346
Deficiency in the Number of Men for Warships, 273
Discipline in the Merchant Service, 435
"Drummond Castle," The loss of the, 137
Duties of the Shipmaster, Legal Requirements, Disabilities and, 345
Engineer's Heroism, An, 137
Engineers' Strike on the Clyde, 273
Experiments in Balanced Pressure Valves, 385
Extension of the Term of Workshop Service for Apprentices, 229
Feed and Circulating Water, etc., by Chemical Means, The Measurement of, 49
First Experiments in favour of the Roller Boat, 435
German Emperor, The, and the Institution of Naval Architects, 138
German Shipyards, Progress of, 94
Grain Cargoes, The Carriage of, 50
Hatch Coamings and their Fittings, 346
High Speed Steamers to the Channel Islands, 309
Improved Speed and Accommodation of Fast and Small Passenger Steamers, 309
Institute of Marine Engineers and Apprentices, 229
Institute of Marine Engineers and the Board of Trade, 310
Institute of Marine Engineers and their Conversazione, 348
Institute of Marine Engineers, Annual Dinner of the, 137
Institution of Mechanical Engineers at Belfast, 230
Institution of Naval Architects in Germany, 138
Invaluable Adjuncts to the Mercantile Marine, 185
Investigations on the Stability of Ships, 2
Labour Troubles at the London Docks, 230
Legal Duties of the Shipmaster at Home and Abroad, 435
Legal Requirements, Disabilities, and Duties of the Shipmaster, 345
Liquid Fuel, 471
Marine Engineers and our Colonies, 137
Marine Salvage Appliances, 51
Measurement of Feed and Circulating Water, etc., by Chemical Means, The, 49
Mercantile Marine Fund, Administration of the, 386
Merits of White Metal for Marine Engines, 94
Microscopical Examination of Metals and Alloys, 49
Move of the P. and O. Directors, The new, 230
Necessity of Providing an Adequate Royal Naval Reserve, The, 273
New Zealand Parliament and Engineers, The, 387
Non-uniform Rolling of Ships, The, 2
North-East Coast Institution of Engineers and Shipbuilders, Annual Meeting of the, 310
P. and O. Company and the London Dock Companies, 280
Petersen Compound Water-Tube Boiler, The, 93
Petroleum Oil for Sea-going Steamers, 471
Pitching Motion of Vessels and the Stresses produced thereby, 51
"Powerful," Trials of the Water-Tube Boilers on the, 385
Practicability of Submarine Boats, 185
Practicable Submarine Torpedo Boat, A, 345
Presidential Address to the North-East Coast Institution of Engineers and Shipbuilders, 310
Progress of German Shipyards, 94
Progress of Safety in Ships During the last Quarter of a Century, 274
Proper and Efficient Manning of the Navy, The, 185
Qualifications and Consequent Status of the Certified Engineer, 810
Recognition of the Qualifications for a Third-class Certificate, 887
Regulations Proposed by the Board of Trade for Second-class Certificates for Marine Engineers, 310
Ridiculous Development of a Trade Strike, 186
Roller Boat, The New, 229, 435
Rolling of Vessels in a Synchronous or Disperiodic Swell, 2
Safety of Watertight Bulkheads, 275
Salvage Appliances, Marine, 51
Satisfactory Settlement of a Strike, 273
Shipmaster at Home and Abroad, Legal Duties of the, 435
Shipmaster's Responsibility on Board Ship, 345
Shipowners and the Mercantile Marine Fund, 386
Society of Arts, Paper on the Bazin Roller Boat, read before the, 435
Soliani, Colonel N., on Watertight Doors, 1
Some Geometry in Connection with the Stability of Ships, 2
Spherical Balanced Valve for all Pressures, A new, 385
Stability of Vessels under all Circumstances, 2
Status of the Marine Engineer as an Officer, 387
Steamboat on Wheels, A Practical, 229
Strikes and their Results, 94
Stupidity and Tyranny of a Trade Strike, 186
Submarine Boats for Purposes of Warfare, 185
Success of the Water-tube Boilers on the "Terrible" and "Powerful," 385
Sulphide of Iron, The Action of the, 49
Summer Meeting of the Institution of Naval Architects in Germany, 138
"Terrible," Trials of the Water-Tube Boilers on the, 385
Theory of Circulation in Water-Tube Boilers, 93
Theory of the Pitching Motion of Ships on Waves, and of the Stresses produced by this Motion, A New, 51
Thermal Efficiency of Crude and Refuse Petroleums, 471
Torpedo Boat, A Practical Submarine, 345
Trade Strike in Messrs. Thornycroft's Works, 186
Trial of a New Submarine Boat, 185
Tubes of Water-Tube Boilers, 93
Watertight Doors and their Danger to Modern Fighting Ships, 1
Water-Tube Boilers on the "Terrible" and "Powerful," Success of the, 385
Water-Tube Boilers, The Circulation of, 93
White Metal Bearings for Marine Engines, 94

ILLUSTRATED ARTICLES.

Adjuncts for Water Gauges, 395
Adjustable Screwing Stock, Winn's Patent, 281
Air Propellers, The "Baird-Thompson," 145
Allison's Patent Furnace Door, 237
Altona, Messrs. Possehl's Coal Wharf at, 187
Application of Wood-Carving to Ships' Decoration, The, 474
Ashton "Lock-up" Safety Valve, The, 18
Automatic Injector, The Buffalo, 59
Automatic Watertight Doors, 442
"Avondale Castle" Before the Launch, The, 355
"Avondale Castle" Leaving the Slips, The, 353
Babcock Boiler, Model of, 54
Baird's Balanced Safety Gear for Bulkhead Doors, 401
"Baird-Thompson" Air Propellers, The, 145
Balanced Pressure Valves; A new spherical balanced Valve for all pressures, 349
Ball & Greer's Patent Steam Trap and Reducing Valve, 285
Baths for Steamships, Specially Designed Lavatories and, 57
Baxter's Steering Gear, 360
Bearings of the Marine Engine, The, 438
Belleville Boiler, Model of, 54
Bever's Patent Duplex Pumping Engine, 276
Blohm & Voss', Messrs., Works, Hamburg, 143 (double-page supplement
Boiler Flues, Draught Gauge for, 190
Boilers, Circulation in Water-Tube, 52
Boilers, Compound Marine, 10, 89
Boilers, Notes on the Maintenance and Repairs of Marine, 231
Boilers, Water-Tube, 6
Boiler Tube Stoppers, Watson's, 9
British Association, Liverpool Meeting, Paper read before the, 349
Brooke's Patent Valve Re-Seating Machine, 359
Buffalo Automatic Injector, The, 59
Bulkhead Doors, Balanced Safety Gear for, 401
Bulkhead Doors, Globular Watertight, 282
Bulwark Port, Lee & Morgan's, 315
Cables for Ships, Improvement in Electric, 318
Cable Shackle, Rae's Patent, 252
"Calais" and "Dover," The Paddle Steamers, 205 (also double-page plate supplement)
"Calais," Triple-Expansion Diagonal Engines of the s.s., 436
"Canada," Twin-screw Steamer, 318
Cargo Gear, Tyzack's Improved, 3
"China," Speaking Tubes as fitted on s.s., 447
"China," The New P. & O. Liner, 397

Circulation in Water-Tube Boilers, 52
Clenchs' High-Speed Engines, 472
Coal Wharf at Altona, Messrs. Possehl's, 187
Combined Drawing Board and Tee Square, 191
Combustion and Higher Steam Pressures, Marine Boilers, Particularly in Reference to Efficiency of, 234
Compensating Nuts, 51
Compound Marine Boilers, 10, 89
Construction of German Men-of-War, Development in Design and, 196
Cylinders of Compound and Triple-Expansion Engines, Power Distribution in the, 285, 316
Cylindrical Shells, The Strength of, 72, 96
Defenceless Navies of the World, The, 480
Development in Design and Construction of German Men-of-War, 196
Dining Saloon of the "Furst-Bismarck," 144
Dome over the Saloon of the "Furst-Bismarck," 144
Donovan's Patent Improved Stern Tube, 68
"Dover" and "Calais," The Paddle Steamers, 205 (also double page supplement)
Draught Gauge for Boiler Flues, 190
Drawing Board and Tee Square, Combined, 191
Drill, Portable Electric Universal, 324
Drysdale & Stoddart's Patent Compensating Nuts, 51
"Dunolly Castle" taking the Water, The, 357
Duplex Pumping Engine, Bever's Patent, 276
Durr Light, The, 319
Electric Cables for Ships, Improvement in, 318
Electric Universal Drill, Portable, 324
"Ellen Rickmers" and "Maria Rickmers," The, 103 (also plate supplement)
Engineering and Erecting Shop of Messrs. Blohm & Voss, Hamburg, 143
Engine, High-Speed, Vertical, 472
Engines, High-Speed, 248
Engines of the s.s. "Calais," 436
Engines of the s s. "Inchmona," 107 (also plate supplement)
Extrusion at High Temperatures, The Production of Metallic Bars of any Section by, 114
Feed-Water Heater and Circulator, 392
Feed-Water Heater, Live Steam, 150
Feed-Water Meter, Kennedy's Patent, 192
Filter, Rankine's Marine, 106
"Fingal," London and Edinburgh Shipping Co.'s s.s., 56 (also plate supplement)
Five-Crank Engines of the s.s. "Inchmona," 107 (also plate supplement)
Friction in Steam Engines, Internal, 182
Furnace Door, Allison's Patent, 237
"Furst-Bismarck," The Twin-Screw Steamer, 144
Gauge for Boiler Flues, Draught, 190
Gauges, Adjuncts for Water, 395
Gear, Improved Cargo, 3
Gear, Steam Steering, 102
Globular Watertight Bulkhead Doors, 282
Governor, Marine Engine, 109
Hamburg-American Co.'s Twin-Screw Steamer "Furst-Bismarck, 144
Hamburg-American Steam Packet Co.'s s.s, "Pennsylvania," 485
Hammers, Pilkington's Improved Steam, 244
"Harman," Patent Feed-Water Heater and Circulator, 392
Heater and Circulator, Feedwater, 392
Heater, Live Steam Feed-Water, 150
High-Pressure Steam Trap, 248
High-Speed Engines, 243
High-Speed Steam Engine, The Universal, 21
High-Speed Vertical Engine, 472
Improved Water Gauge, An, 286
Improvement in Electric Cables for Ships, 318
"Inchmona," Engines of the s.s., 107 (also plate supplement)
Indicator, The Simplex Patent, 311
Injector, The Buffalo Automatic, 59
Institution of Naval Architects, Papers read before the, 6, 10, 52, 196
Internal Friction in Steam Engines, 182
Keats' Marine Engine Governor, 109
Kennedy's Patent Feed-Water Meter, 192
Ladies' Drawing Room of the "Furst Bismarck," 144
Lamp for Burning Hydro-carbon Oils, 319
"Lancaster" Wave Spring Piston, The, 312
Lavatories and Baths for Steamships, Specially designed, 57
Lee & Morgan's Bulwark Port, 315
Live Steam Feed-Water Heater, 150
"Lock-up Safety Valve, The, 18
London and Edinburgh Shipping Co.'s s.s. "Fingal," 56 (also plate supplement)
London Chatham and Dover Railway Co.'s paddle steamer "Calais," 205 (also double plate supplement)
Maintenance and Repairs of Marine Boilers, Notes on the, 231
"Maria Rickmers" and "Ellen Rickmers," The, 103 (also plate supplement)
Marine Boilers, Compound, 10, 89
Marine Boilers, Particularly in Reference to Efficiency of Combustion and Higher Steam Pressures, 234
Marine Engine Governor, Keats', 109
Marine Engine, The Bearings of the, 438
Marine Filter, Rankine's Patent, 106
Martin's Patent Union Nut, 445
McDougall's Patent High-Pressure Steam Trap, 248
Men-of-War, Development in Design and Construction of German, 196
Metallic Bars of any Section by Extrusion at High Temperatures, The Production of, 114
Meter, Patent Feed-Water, 192
Morse Steam Valve, 476
Multiple Punching Machine, 348
Naval Architects, Papers read before the Institution of, 6, 10, 52, 196
Naval Architects, Visit to Hamburg and Stettin of the, 141
Navies of the World, The Defenceless, 480
New Zealand Government Cables Repairing of the, 276
Niclausse Boiler, Model of, 55
Notes on the Maintenance and Repairs of Marine Boilers, 231
North-East Coast Institution of Engineers and Shipbuilders, Papers read before the, 231, 234
Nut, Patent Union, 445
Nuts, Drysdale & Stoddart's Patent Compensating, 51
Papers read before the Institution of Naval Architects, 6, 10, 52, 196
Paddle Steamers "Dover" and "Calais," The New, 205 (also double-page plate supplement)
Peninsular and Oriental Liner, "China," 397
"Pennsylvania," The s.s., 485
Picking-up and Paying-out Machine, 276
Pilkington's Improved Steam Hammers, 244
Piston, The "Lancaster" Wave Spring, 312
Portable Electric Universal Drill, 324
Possehl's, Messrs., Coal Wharf at Altona, 187
Power Distribution in the Cylinders of Compound and Triple-Expansion Engines, 285, 316
Powerful Steam Stamp, 95
Pressure Valves; A New Spherical Balanced Valve for All Pressures, Balanced, [349
Production of Metallic Bars of any Section by Extrusion at High Temperatures, The, 114
Propellers, The "Baird-Thompson" Air, 145
Pumping Engine, Duplex, 276
Punching Machine, Multiple, 348
Rae's Patent Cable Shackle, 252
Rankine's Patent Marine Filter, 106
Reducing Valve, Steam Trap and, 285
Repairs of Marine Boilers, Notes on the Maintenance and, 231
Re-Seating Machine, Brooke's Patent Valve, 359
Richards' "Scarfing" Machine, 5
Royal Mail Twin-Screw Steamer "Canada," 318
Safety Gear for Bulkhead Doors, Balanced, 401
"Scarfing" Machine, Richards', 5
Screwing Stock, Adjustable, 281
Shackle, Cable, 252
Shells, The Strength of Cylindrical, 72, 96
Shipbuilding and Engineering Works of Messrs. Blohm & Voss, Hamburg, 143 (double-page supplement)
Shipbuilding and Engineering Works of Messrs. The Vulcan Co., Bredow, Stettin, 144 (double-page supplement)
Ships' Decoration, The Application of Wood-Carving to, 474
Ships' Watertight Doors, 388
Simplex Patent Indicator, The, 311
Sirens, Steam, 13
Speaking Tubes on Board Ship, 447
Specially Designed Lavatories and Baths for Steamships, 57
Spring Piston, The "Lancaster" Wave, 312
Stanley-Howard Patent Combined Drawing Board and Tee Square, The, 191
Steam Engines, Internal Friction in, 182
Steam Engine, The Universal High-Speed, 21
Steam Hammers, Improved, 244
Steam Pressures, Marine Boilers, Particularly in Reference to Efficiency of Combustion and Higher, 234
Steam Sirens, 18
Steam Stamp, Powerful, 95
Steam Steering Gear, Harrison's, 102
Steam Trap and Reducing Valve, Ball & Greer's, 285
Steam Trap, High-Pressure, 248
Steam-Valve, Morse, 476
Steering Gear, Baxter's, 360
Stern Tube, Donovan's Improved, 68
Strength of Cylindrical Shells, The, 72, 96
Tee Square, Combined Drawing Board and, 191
Torpedo-guard System of Defence, 480
Thornycroft Boiler, Model of, 54
Triple-Expansion Diagonal Engines of the s.s. "Calais," 436
Triple-Expansion Engines, Power Distribution in the Cylinders of Compound and, 285, 316
Tube, Donovan's Improved Stern, 68
Tubes as Fitted on s.s. "China," Speaking, 447
Tube Stoppers, Boiler, 9
"Tutanekai," for the New Zealand Government, 276
Twin-Screw Steamer "Canada," 318
Tyzack's Improved Cargo Gear, 3
Union Nut, Martin's Patent, 445
Universal High-Speed Steam Engine, The, 21
Valve Re-Seating Machine, Brooke's Patent, 359
Valve, The "Lock-up" Safety, 18
Valve, Morse Steam, 476
Vulcan Works, Bredow, Stettin; Views of the, viz.:—
    Brazilian Ironclad, "24 De Mayo," in Floating Dock, 149
    Erecting Shop, 153
    Foundry and Clock Tower, 143
    Foundry at the Vulcan Works, 147
    Front View of Erecting Shop, 155
    General View of the Works, 144 (double-page supplement)
    Heavy Erecting Shop 160
    Laying the Keel of a Mail Steamer, 141
    Locomotive Erecting Shop, 160 (two views)
    Main Erecting Shop, 160
    Marine Engine being Erected, 160
    Stern of Brazilian Ironclad, "24 De Mayo," 151
    Turning Shops, One of the Large, 160
Water Gauge, An Improved, 286
Water Gauges, Adjuncts for, 395
Watertight Bulkhead Doors, Globular, 282
Watertight Doors, Automatic, 442
Watertight Doors, Ships', 388
Water-Tube Boilers, 6
Water-Tube Boilers, Circulation in, 52
Watson's Patent Boiler Tube Stoppers, 9
Wave Spring Piston, The "Lancaster," 312
Winn's Patent Adjustable Screwing Stock, 281
Wood-Carving to Ships' Decoration, The Application of, 474
Yarrow Boiler, Model of, 54

GENERAL INDEX.

Accident to the French Tourist Steamer, The, 245
Activity in French Dockyards, 488
Adjuncts for Water Gauges, 395
Adjustable Screwing Stock, 281
Admiralty Inspection, The, 156
Air Propellers, The "Baird-Thompson," 145
Allan Line, The, 20
Allison's Patent Furnace Door, 237
"Almirante Simpson," Official Trials of the, 204
Altona, Coal Wharf at, 187
Aluminium, 9
American Competition, The, 245
American Mail, The, 449
American Purchase, An, 315
American Torpedo Boats, 320
Amusing Account, An, 314
Annual Dinner of the Institute of Marine Engineers, 150
Anti-Fouling Boiler Fluid, Peel's, 114
Antifriction Metals, Boiler and Engine Fittings, 57
Anti-Incrustation Fluid, 247
Application of Wood-Carving to Ships' Decoration, The, 474
Appointments, Naval Engineer, 28, 73, 115, 162, 211, 255, 290, 326, 383, 415, 454, 490
Armour-Plated Torpedo-Boat Destroyer for the Argentine Government, Launch of an, 108
Asbestos, Blue, 4
Ashton "Lock-up" Safety Valve, The, 18
Assembling for Instruction, 205
Atlantic Competition, New, 19
Atlantic Transport Company, The, 106
Atlantic Veteran, An, 104
Atlantic Weather, 246
"Augusta Victoria," The Hamburg Company's, 448, 461
Austro-Hungarian Lloyd, The, 203
Automatic Injector, The "Buffalo," 59
Automatic Watertight Doors, 442
"Avondale Castle" before the Launch, The, 353
"Avondale Castle" leaving the Slips, The, 353
Babcock Boiler, Model of, 54
Baird's Balanced Safety Gear for Bulkhead Doors, 401
"Baird-Thompson" Air Propellers, The, 145
Balanced Pressure Valves; a new Spherical Balanced Valve for all Pressures, 349
Ball & Greer's Patent Steam Trap and Reducing Valve, 285
Baths for Steamships, Specially Designed Lavatories and, 57
Battleships, The New, 452
Baxter's Steering Gear, 360
Bearings of the Marine Engine, The, 488
Belleville Boiler Abroad, The, 207
Belleville Boiler, Model of, 54
Bever's Patent Duplex Pumping Engine, 276
Blockade Running, 394
Blohm & Voss, Messrs., Hamburg, Shipbuilding and Engineering Works of, 143
Blue Asbestos, 4
Bluejackets at a Tournament, 110
Boiler and Engine Fittings, Antifriction Metals, 57
Boiler and Pipe Covering, A New, 402
Boiler Flues, Draught Gauge for, 190
Boiler Fluid, Anti-Fouling, 114
Boilers, Circulation in Water-Tube, 52
Boilers, Compound Marine, 10, 89
Boilers, Notes on the Maintenance and Repairs of Marine, 231
Boilers, Water-Tube, 6
Boiler Tube Stoppers, Watson's, 9
Boon to the Travelling Public, A, 281
Brassey's Naval Annual, 111
Brazilian Ironclad "24 De Mayo" in Floating Dock, Vulcan Works, Bredow, Stettin, 149
Breaking up Old Ships, 448, 487
Bristol Channel Centre, Institute of Marine Engineers, Annual Dinner, 357
Bristol Channel Centre of the Institute of Marine Engineers, 194
British Association, Liverpool Meeting, Paper read before the, 349
Brussels Exhibition, 359
Brooke's Patent Valve Re-seating Machine, 359
Buffalo Automatic Injector, The, 59
Bulkhead Doors, Balanced Safety Gear for, 401
Bulkhead Doors, Globular Watertight, 262
Bulwark Port, Lee & Morgan's, 315
Cables for Ships, Improvements in Electric, 318
Cable Shackle, 252
"Cæsar" and "Illustrious," Launch of the, 288
"Calais" and "Dover," The new Paddle Steamers, 205
"Calais," Triple-Expansion Diagonal Engines of the s.s., 436
Calls at French Ports, 204
"Canada," Twin-Screw Steamer, 318
Canadian Atlantic Service, The, 395
Cardiff Meeting of the North-East Coast Institution of Engineers and Shipbuilders, 154, 195, 231, 234
Cargo Gear, Improved, 3
Carlingford Lough, A New Pleasure Steamer for, 191
"Carlo Alberto," Launch of the, 320
Carrier Pigeons in Naval Warfare, 206
Castle Line, The, 246, 313, 449
Castle Mail Packet, The Latest, 279
"Catinet," Launch of the, 322
Changes in the Fleets, 20
Channel Fleet Inspection, 252
Chatham Dockyard, 27, 66, 113, 206, 250, 288, 322, 368, 399, 452, 482
"China," Speaking Tubes as fitted on s.s., 447
"China," The P. & O., Liner, 397
Chilian Navy, Trial of a Torpedo Gunboat for the, 204
Circulation in Water-Tube Boilers, 52
Civil Engineers, Paper Read before the Institution of, 35
Clench's High Speed Engines, 472
Close of the Manœuvres, The, 249
Coaling Warships, 207
Coal Wharf at Altona, Messrs. Possehl's, 187
Collision in the St. Lawrence, The, 394
Combined Drawing Board and Tee Square, 191
Combustion and Higher Steam Pressures, Marine Boilers, Particularly in Reference to Efficiency of, 234
Commemoration of Trafalgar, The, 251
Comparative Sea Power, 362
Compensating Nuts, Drysdale & Stoddart's, 51
Compound Marine Boilers, 10, 89
Construction of German Men-of-War, Development in Design and, 196
Consulting Naval Architect, A New, 278
Continental Service, The, 148
Contracts for New First-Class Cruisers, 363
Conversazione of the Hull and District Institute of Engineers and Naval Architects, 388
Conversazione of the Institute of Marine Engineers, 390
Co-operative Educational Travel, 204
Corrosion of Marine Machinery, Unusual, 253
Cost of Foreign Warships, 484
Cruises and Trial Trips, 112
Cunard Company, The, 208, 245, 278
Curious Arrangement, A, 106
Cylinders of Compound and Triple-Expansion Engines, Power Distribution in the, 285, 316
Cylindrical Shells, The Strength of, 72, 96
Daily Press, The, 487
Dangerous Paints on Board H.M. Ships, 483
Dawes, Sir Edwyn Sandys, K.C.M.G., Presidential Address, 390
Defenceless Navies of the World, The, 480
Departure, A New, 314
Designs of the Ships, The, 25
Development in Design and Construction of German Men-of-War, 196
Devonport and Keyham, 27, 112, 251, 288, 363
Devonport Dockyard, 67, 206, 322, 399, 451, 488
Dining Saloon of the "Furst-Bismarck," 157
Disasters, 393
Distant Signalling, 206
Distribution of the "Edgar" Boat Fund, The, 451
Dome over the Saloon of the "Furst-Bismarck," 159
Dominion Line, The, 104
Donovan's Patent Improved Stern Tube, 68
"Doris," H.M.S., Launch of, 4
"Dover" and "Calais," The New Paddle Steamers, 205
Dover and Ostend Steamer, New, 361
Draught Gauge for Boiler Flues, 190
Drawing Board and Tee-Square, Combined, 191
Dredging, Effects of, 445
Drill, Portable Electric Universal, 324
Drysdale & Stoddart's Patent Compensating Nuts, 51
"Dunolly Castle" Taking the Water, The, 355
Duplex Pumping Engine, 276
Durr Light, The, 319
"Eclipse," Trials of the, 157
Effects of Dredging, 445
Electric Cables for Ships, Improvements in, 318
Electric Universal Drill, Portable, 324
Electricity in the Navy, 111
Electricity on Board Ships, The Use of, 242
"Ellen Rickmers" and "Maria Rickmers," The, 103
Employers' Association, Annual Meeting Iron Trades, 188
Engineer Appointments, Naval, 28, 73, 115, 162, 211, 255, 290, 326, 383, 415, 454, 490
Engineer-in-Chief and Naval Engineers, The, 112
Engineering and Erecting Shop of Messrs. Blohm & Voss, Hamburg, 140
Engineer in Naval Warfare, The, 159, 398
Engineer Officers and the Estimates, 26
Engineers and Stokers in the Reserve, 66
Engineer's Feat, An, 355
Engineer's Heroism, An, 148
Engineers in Ships of War, 398
Engineers of the Navy, 398
Engineer Students at Keyham, The, 67
Engines, High-Speed, 243
Engines, High Speed Vertical, 472
Engines of the s.s. "Calais," 436
Engines of the s.s. "Inchmona," 107
Engine Trials, Superheated-Steam, 446
Entry and Training of Engine-Room Staff, 65
Entry and Training of Naval Cadets, The, 25
Entry of Engineer Students, 159
Erecting Shop, Vulcan Works, Bredow, Stettin, 153
Executive Titles for American Naval Engineers, 484
Exhibition, Brussels, 359
Explosion on Board the "Terrible," 112
Expedition to Benin, The, 450
Express Line to Canada, The New, 148
Extrusion at High Temperatures, The Production of Metallic Bars of any Section by, 114
Fast Steaming on the Atlantic, 149, 203
Feed-Water Heater and Circulator, 392
Feed-Water Heater, Live Steam, 150
Feed-Water Meter, Kennedy's Patent, 192
Filter, Marine, 106
"Fingal," London and Edinburgh Shipping Co.'s s.s., 56
Fire at the Fairfield Shipbuilding Works, The, 484
Five-Crank Engines of the s.s. "Inchmona," 107
Fleets of the Mail Lines, 19, 69, 104, 147, 202, 245, 277, 318, 354, 398, 448, 486
Fleets of the Narrow Seas, The, 202
Fleets of the Sea Powers, The, 362
Float-Out of the "Mars," The, 68
Fluid, Anti-Fouling Boiler, 114

Foreign Competition, 280
Foundry and Clock Tower, Vulcan Works, Bredow, Stettin, 143
Foundry at the Vulcan Works, Bredow, Stettin, 147
French Programme, The New, 364
French School of Naval War, 486
French Tourist Steamer's Accident, The, 203
French Types of Warships, 158
Front View of Erecting Shop, Vulcan Works, Stettin, 155
Furnace Door, Allison's, 237
"Furst-Bismarck," The Hamburg-American Co.'s Twin-Screw Steamer, 161
Gauge for Boiler Flues, Draught, 190
Gauges, Adjuncts for Water, 395
"Gaulois," Launch of the, 322
Gear, Improved Cargo, 3
Gear, Steam Steering, 102
General Programme and Progress, 66
Globular Watertight Bulkhead Doors, 282
Goschen, Mr., and Engineers, 361
Governor, Marine Engine, 109
Grand Manœuvres or Tactical Exercises, 156
Great Disaster, The, 147
Gunboat Flotilla on the Nile, The, 320
Hamburg-American Co.'s Twin-Screw Steamer "Furst-Bismarck," 161
Hamburg-American Steam Packet Co.'s S.S. "Pennsylvania," 486
Hammers, Pilkington's Improved Steam, 244
"Hannibal," Launch of the, 111
Harbour Entrance, Natal, 103
Harland, The late Sir Edward, 315
Health of the Navy, The, 482
Heater and Circulator, "Harman's" Patent Feed-Water, 392
Heater, Live Steam Feed-Water, 150
Heavy Erecting Shop, Vulcan Co., Bredow, Stettin, 160
Hicks-Beach, Sir Michael, on the Increase in Naval Expenditure, 451
High-Pressure Steam Trap, 248
High-Speed Engines, 243
High-Speed Vertical Engine, 472
High-Speed Steam Engine, The Universal, 21
"Himalaya" Troopship, The, 158
Hull and District Institute of Engineers and Naval Architects, Conversazione of, 388
Hydraulic Valves, 351
Ignorance of the Daily Press, The, 395
"Illustrious" and "Cæsar," Launch of the, 288
Imaginary Shipwreck, An, 247
Improved Water Gauge, An, 286
Improvement in Electric Cables for Ships, 318
"Inchmona," Engines of the, 107
Indicator, The Simplex Patent, 311
Injector, The "Buffalo" Automatic, 59
Institute of Marine Engineers' Annual Dinner, 150
Institute of Marine Engineers, Bristol Channel Centre, 194
Institute of Marine Engineers, Bristol Channel Centre, Annual Dinner of the, 357
Institute of Marine Engineers, President's Address, 390
Institution of Civil Engineers, Paper read before the, 35
Institution of Mechanical Engineers, Paper read before the, 258
Institution of Naval Architects, 14, 60, 483
Institution of Naval Architects in Germany, The Summer Meeting of the, 141, 208, 238
Institution of Naval Architects, Papers read before the, 6, 10, 52, 196
International Ocean Race, 20
Iron Trades' Employers' Association, Annual Meeting, 188
Italian Naval Council of Defence, An, 453
Japanese Mercantile Marine, The, 315
Japanese Warships, New, 208
Keats' Marine Engine Governor, 109
Kennedy's Patent Feed-Water Meter, 192
Kites for Naval Purposes, 453
La Compagnie Generale Transatlantique, 202, 314
Ladies' Drawing-Room of the "Furst-Bismarck," 157
Lamp for Burning Hydro-Carbon Oils, 319
"Lancaster" Wave Spring Piston, The, 312
Late Chief Engineer of the "Blake," The, 399
Launches of French Warships, 322
Launching a French Cruiser, 158
Launch of an Armour-Plated Torpedo-Boat Destroyer for the Argentine Government, 108
Launch of an Italian Warship, 320
Launch of H.M.S. "Doris," 4
Launch of H.M. Torpedo-Boat Destroyer "Star," 252
Launch of the "Cæsar" and "Illustrious," 288
Launch of the "Hannibal," 111
Launch of H.M.S. "Niobe," 477
Launch of the "Saint Louis," 289
Lavatories and Baths for Steamships, Specially Designed, 57
Laying the Keel of the "Ocean," 483
Laying the Keel of a Mail Steamer, Vulcan Works, Bredow, Stettin, 141
Lee & Morgan's Bulwark Port, 315
Lengthening a Record Breaker, 20
Lessons of the Manœuvres, 249
Letters to the Papers, 202
Life Insurance and Pensions for Officers, 354
Life-Saving Appliances, 191
Liquid Fuel for the Navy, 364
Liquid Fuel in Foreign Navies, The Use of, 482
Liquid Fuel in Germany, 289
List of Vessels Launched in 1896, 403
Littoral Drift, 35
Liverpool Improvements, 104
Live Steam Feed-Water Heater, 150
"Lock-Up," Safety Valve, The, 18
Locomotive Erecting Shop, Vulcan Co., Bredow, Stettin, 160
London and Edinburgh Shipping Co.'s S.S. "Fingal," 56
London Chatham & Dover Railway Co.'s Paddle Steamer "Calais," 205
MacAndrew's Hymn, 354
Mail Lines, Fleets of the, 19, 69, 104, 147, 202, 245, 277, 315, 354, 393, 448, 486
Main Erecting Shop, Vulcan Co., Bredow, Stettin, 160
Maintenance and Repairs of Marine Boilers, Notes on the, 231
"Majestic," Trials of the, 363
Manning of the Navy, The, 250
Man-of-War Launches, 27
"Maria Rickmers" and "Ellen Rickmers," The, 103
Marine Boilers, Compound, 10, 89
Marine Boilers, Particularly in Reference to Efficiency of Combustion and Higher Steam Pressures, 234
Marine Engine Being Erected, Vulcan Co., Bredow, Stettin, 160
Marine Engineering Industries, A Trades Union Leader on the Outlook in, 472
Marine Engineers' Annual Dinner, Institute of, 150
Marine Engine Governor, Keats', 109
Marine Engine, The Bearings of the, 438
Marine Filter, Rankine's, 106
Marine Machinery, Unusual Corrosion of, 253
"Mars," The Float-out of the, 68
Martin's Patent Union Nut, 445
McDougall's Patent High-Pressure Steam Trap, 248
Men-of-War, Development in Design and Construction of German, 196, 238
Metallic Bars of any Section by Extrusion at High Temperatures, The Production of, 114
Metals, Boiler and Engine Fittings, Anti-Friction, 57
Meter, Kennedy's Patent Feed-Water, 192
Morse Steam Valve, 476
Morse Valve Re-Seating Machine, The, 64
Moss, H. E., & Co.'s Steamship Circular, 194
Multiple Punching Machine, 348
Names of our Warships, The, 158
Natal Harbour Entrance, 103
National Line Report, The, 489
Nation's Food Supply, The, 399
Naval Administration, 26
Naval Architects in Germany, The Summer Meeting of the Institution of, 141 208, 238
Naval Architects, Institution of, 14, 60
Naval Architects, Institution of, Papers Read before the, 6, 10, 52, 196
Naval Contracts and Contractors, 27
Naval Editors, Some, 246
Naval Efficiency, 450
Naval Engineer Appointments, 28, 73, 115, 162, 211, 255, 290, 326, 383, 415, 454 490
Naval Engine-Room Complements, 287
Naval Expenditure in Germany and Italy, 400
Naval Manœuvres, 154
Naval Mishaps, 320
Naval Mobilisation, The, 205
Naval Movements, 364
Naval Officers and the Bluecoat School, 322
Naval Programme, The New, 24
Naval Works Bill, The, 26
Naval Works, Two New, 68
Navies of the World, The Defenceless, 480
Navy and Lord Wolseley, The, 361
Navy Employment Agency, The, 252, 483
Navy Estimates in France, The, 399
Navy on a War Footing, The, 450
Navy Records Society, 159
Needs of Naval Engineering, The, 111
Netherland-American Line, The, 356
New York Harbour Facilities, 105
New York Mails 395
New Zealand Government Cables, Repairing of the, 276
Niclausse Boiler, Model of, 55
"Niobe," Launch of H.M.S., 477
North-East Coast Institution of Engineers and Shipbuilders at Cardiff, 154, 195, 231, 234
North-East Coast Institution of Engineers and Shipbuilders, Papers read before the, 281, 234
North-German Lloyd Company, The, 246, 318
Notable Experiment, A, 204
Notes on the Maintenance and Repairs of Marine Boilers, 231
Nut, Patent Union, 445
Nuts, Drysdale & Stoddart's Compensating, 51
"Ocean," Laying the Keel of the, 483
"Oceanic," New White Star Mail Steamer, 505
"Octopus," The Dredger, 445
Old Holyhead Mail Boats, The, 394
Old Tonnage and New, 19
On Signs of Weakness in Tank Steamers, 239
Our Fleets on Foreign Stations, 251
Paddle Steamers "Dover" and "Calais," The New, 205
Paddle v. Twin-Screw, 487
P. & O. Company's Meeting, 393
P. & O. Company, The, 150
P. & O. Directors, The New Move of the, 245
Pacific Steam Navigation Company, The, 488
"Paris," The, 449
Partially Immersed Screw Propellers, 475
Particular Service Squadron, 110, 363
Peel's Anti-Fouling Boiler Fluid, 114
Pembroke Dockyard, 27, 68, 118, 207, 252, 289, 323, 364, 400, 453, 484
Peninsular and Oriental Liner "China," 397
"Pennsylvania," The S.S., 486
"Perfect" Stair-Tread, The, 208
Phosphor Bronze Co., Limited, 58
Picking-up and Paying-out Machine, 276
Pigeons for New Purposes, 289
Pilkington's Improved Steam Hammers, 244
"Pioneer," Pleasure Steamer for Carlingford Lough, 191
Pipe Covering, A New Boiler, 402
Piston, The "Lancaster" Wave Spring, 312

Pleasure Steamer for Carlingford Lough, A New, 191
Portable Electric Universal Drill, 324
Port of Sunderland, The, 396
Port of the Future, The 395
Portsmouth Dockyard, 26, 65, 111, 206, 250, 287, 323, 362, 398, 451, 482
Possehl's, Messrs , Coal Wharf at Altona, 187
Power Distribution in the Cylinders of Compound and Triple-Expansion Engines, 285, 316
"Powerful" and "Terrible," The, 156, 207, 250, 364, 452
Powerful Steam Stamp, 95
Pressure Valves; A New Spherical Balanced Valve for all Pressures, Balanced, 349
"Prince George" and "Victorious," Speed Trials of the, 288
"Princess Clementine," The New Steamer, 361
Production of Metallic Bars of any Section by Extrusion at High Temperatures, The, 114
Propellers, The "Baird-Thompson" Air, 145
Propeller, Willcox's "Improved," 326
Protection against Torpedo Attack, A New, 452
Provision of Officers and Men, The, 25
Publications, 20, 204, 247, 449, 488
Pumping Engine, Bever's Patent Duplex, 276
Punching Machine, Multiple, 348
Racing in Narrow Waters, 281
Rae's Patent Cable Shackle, 252
Rankine's Patent Marine Filter, 106
Record Making, 203
Record of Sixty-Nine Years, The, 362
Reducing Valve, Steam Trap and, 285
Remarkable Experience, A, 315
"Renown," Steam Trials of the, 66
Repairs of Marine Boilers, Notes on the Maintenance and, 231
Report of the National Life-Saving Society, The, 486
Re-Seating Machine, Brooke's Patent Valve, 359
Re-Seating Machine, The Morse Valve, 64
Reserve of Armed Cruisers, The, 148
Reserve of Ships and Men, The, 155
Retiring from the Passenger Business, 277
Return of the Italian Visit, 156
Richards' "Scarfing" Machine, 5
Roper's Patent Life-Saving Appliances, 191
Royal Mail Passenger and Cargo Services, 204
Royal Mail Twin-Screw Steamer "Canada," 318
Royal Naval Reserve, The, 106
Royal United Service Institution, Journal of the, 65
Royal United Service Institution, The, 398
Russian Fleet, The, 400
Russian Volunteer Fleet, The, 105
Russian Warship Construction, 323
Safety Gear for Bulkhead Doors, Balanced, 401
Sailor's Heroism, A, 70
"Saint Louis," Launch of the, 289
"Santa Fe," Trials of the, 208
"Scarfing" Machine, Richard's, 5
"Scot," The Cape Liner, 149
Screwing Stock, Adjustable, 281
Screw Propellers, Partially Immersed, 475
Sea-Carrying Trade, The, 284
Shackle, Rae's Patent Cable, 252
Sheerness Dockyard, 27, 67, 112, 207, 251, 289, 322, 364, 400, 453, 486
Shells, The Strength of Cylindrical, 72, 96
Sherval's Patent Anti-Incrustation Fluid, 247
Shipbuilding and Engineering Works of Messrs. Blohm & Voss, Hamburg, 143
Shipbuilding and Engineering Works of Messrs. The Vulcan Co., Bredow, Stettin, 144
Shipbuilding in French Yards, 453
Shipbuilding in Germany, 208
Shipbuilding Returns of United Kingdom in 1896, arranged in order of Tonnage Built by each Firm, Summary of, 431
Shipbuilding Scheme, The, 25
Shipping News from Southampton, 69
Ships' Decoration, The Application of Wood-Carving to, 474
Ships for the Argentine and Brazil, New, 158
Ships' Watertight Doors, 388
Simplex Patent Indicator, The, 311
Sirens, Steam, 13
Southampton and the Troops for the Cape, 70
Southampton Atlantic Steamers, The, 356
Spanish Shipbuilding, 484
Spanish Transatlantic Company, The, 278, 313
Speaking Tubes on Board Ship, 447
Specially designed Lavatories and Baths for Steamships, 57
Speed Trials of the "Victorious" and "Prince George," 288
Spring Piston, The "Lancaster" Wave, 312
Stair-Tread, The Perfect, 208
Stanley-Howard Patent Combined Drawing Board and Tee Square, 191
"Star," Launch of H.M. Torpedo-Boat Destroyer, 252
Steam Engine, The Universal High-Speed, 21
Steam Hammers, Improved, 244
Steam Pressure, Marine Boilers, Particularly in Reference to Efficiency of Combustion and Higher, 234
Steamship Amalgamation, The, 279, 315
Steamship Circular, H. E. Moss & Co.'s, 194
Steamship Company's Meetings, Several, 69
Steamship Company, A New, 148
Steam Sirens, 13
Steam Stamp, Powerful, 95
Steam Steering Gear, 102
Steam Trap and Reducing Valve, 285
Steam Trap, High Pressure, 248
Steam Trials in the British Navy, 323
Steam Trials of the "Powerful" and "Terrible," The, 45
Steam Trials of the "Renown," 66
Steam Valve, Morse, 476
Steering Gear, Baxter's, 360
Stern of Brazilian Ironclad, "24 De Mayo," Vulcan Works, Bredow, Stettin, 151
Stern Tube, Improved, 68
Story of Naval Administration, A, 398
Stowaway Nuisance, The, 450
Straits of Belle Isle, The, 105
Strength of Cylindrical Shells, The, 72, 96
Subsidised Mercantile War Auxiliaries, The, 66
Summary of Shipbuilding Returns of United Kingdom in 1896, arranged in order of Tonnage built by each Firm, 431
Summer Meeting of the Institution of Naval Architects in Germany, The, 141, 208, 238
Sunderland, The Port of, 396
Superheated Steam Engine Trials, 446
Supply of Engineer Officers, The, 68
Tank Steamers, On Signs of Weakness in, 239
Tee Square, Combined Drawing Board and, 191
Temperley Coaling Apparatus, 289
"Terrible" and "Powerful," The, 156, 207, 250, 364, 452
"Terrible," Explosion on Board the, 112
Thornycroft Boiler, Model of, 54
Thousand Pounds Pressure, A, 353
Torpedo-Boat Destroyer for the Argentine Government, Launch of an Armour-Plated, 108
Torpedo-Boat Destroyers, More, 207
Torpedo-Boat Destroyers, The, 67, 110, 322, 452
Torpedoes and Torpedo Warfare, 112
Torpedo Flotilla, The, 205
Torpedo-Guard System of Defence, 480
Trade, The Sea-Carrying, 284
Trades Union Congress and the Dockyard Labourers, The, 451
Trades Union Leader on the Outlook in Marine Engineering Industries, A, 472
Trafalgar, Anniversary of the Battle of, 320
Training of Stokers, The, 400
Transfer of British Ships to Foreign Flags, The, 105
Travel to the Cape, 354
Trial of a Torpedo Gunboat for the Chilian Navy, 204
Trials of the "Eclipse," 157
Trials of the "Majestic," 343
Trials of the "Santa Fe," 208
Trials, Superheated Steam Engine, 446
Triple-Expansion Diagonal Engines of the S.S. "Calais," 436
Triple-Expansion Engines, Power Distribution in the Cylinders of Compound and, 285, 316
Trips to the Welsh Coast, 105
Trooping Season, The, 104
Tube, Improved Stern, 68
Tubes as Fitted on S.S. "China," Speaking, 447
Tube Stoppers, Boiler, 9
Turning Shops, One of the Large, Vulcan Co., Bredow, Stettin 160
"Tutanekai," for the New Zealand Government, 276
Twin-Screw Steamer "Canada," 318
Tyzack's Improved Cargo Gear, 3
Unfortunate Mishap, An, 148
Union Line, The, 202, 314, 448
Union Nut, Martin's Patent, 445
"United Service Magazine," 484
United States Naval Administration, 208
United States Navy, 156
United States Warships, The, 322
Universal High-Speed Steam Engine, The, 21
Unusual Corrosion of Marine Machinery, 253
Use of Electricity on Board Ships, 242
Valve Re-Seating Machine, 359
Valve Re-Seating Machine, The Morse, 64
Valve, The "Lock-up" Safety, 18
Valve, Morse Steam, 476
Various Descriptions of Doors Applicable to Watertight Bulkheads, 240
Vessels for the Atlantic Trade, The New, 246
Vessels Launched in 1896, List of, 403
"Victorious" and "Prince George," Speed Trials of the, 288
Volunteer Fleet, The, 149
Vulcan Co., Messrs, The, Bredow, Stettin, Shipbuilding and Engineering Works, 144
Water Gauge, An Improved, 286
Water Gauges, Adjuncts for, 395
Water in the Boilers, 206
Watertight Bulkhead Doors, Globular, 282
Watertight Doors, 240
Watertight Doors, Automatic, 442
Watertight Doors, Ships', 358
Water-Tube Boilers, 6
Water-Tube Boilers, Circulation in, 52
Water-Tube v. Cylindrical Boilers, 482
Watson's Patent Boiler Tube Stoppers, 9
Wave Spring Piston, The "Lancaster," 312
Weakness in Tank Steamers, On Signs of, 239
West India Royal Mail Steam Packet Co., The, 393, 450
White Star Mail Steamer, New, 505
Willcox's "Improved" Propeller, 326
Willegerod, Captain William, 104
Winn's Patent Adjustable Screwing Stock, 281
Wood-Carving to Ships' Decoration, The Application of, 474
Wonderful Piece of News, The Most, 202
Yarrow Boiler, Model of, 54

TRADE NOTES, &c.

Belfast, 33, 78, 120, 167, 216, 261, 296, 331, 370, 422, 460, 496
Clyde and Scotland, 29, 74, 116, 163, 211, 256, 291, 327, 365, 415, 455, 491

Hardwood Market Report, 28, 73, 115, 162, 211, 290, 344, 384, 415, 454, 490
Mersey, 32, 76, 118, 165, 214, 259, 294, 330, 368, 420, 458, 494
Naval Matters, Past and Prospective, 24, 65, 110, 154, 205, 249, 287, 320, 361, 398, 450, 482
North-West of England, 34, 78, 120, 167, 216, 262, 297, 332, 370, 423, 460, 495
Tyne, Wear, Tees, Hartlepools, &c., 30. 74, 116, 164, 212, 257, 292, 328, 366, 417, 457, 492

OBITUARY.

Andrews, Captain, 486
Bates, Sir Edward, 314
Blechynden, Mr. A., 489
Lobnitz, Henry C., 402
Kircaldy, Mr. David, 486
Ramsden, Sir James, 314

LETTERS TO THE EDITOR.

Arc Lamp, Johnson & Phillips, 271
Atlas Metal Co., Limited, The, 343
Boileau's Traverse Tables, 432
Compound Marine Boilers, 89
Course of Training for Engineers, 383
Designing, Screw Propeller, 307
Engineers of the Royal Naval Reserve, 90
Institution of Naval Architects, 502
Internal Friction in Steam Engines, 182, 307
Johnson & Phillips' Arc Lamp, 271
Marine Boilers, Compound, 89
Metal, Atlas Anti-Friction, 343
Naval Architects, Institution of, 502
North German Lloyd Co., The, 383
Piston Packing, 307
Qualifications for Second Engineers, 432
Royal Naval Reserve, The, 90
Screw Propeller Designing, 307
Sea Service, The, 383
Second Engineers, Qualifications for, 432
Steam Engines, Internal Friction in, 182, 307
Traverse Tables, Boileau's, 432
Willigerod, Captain, of the North German Lloyd, 383

BOOKS REVIEWED.

"A 1" Shipping Directory and Handbook to Foreign Ports, 503
Administration, Naval, by Sir R. Vesey Hamilton, G.C.B., 179
Annual, The Naval, Edited by T. Brassey, 180
Aspin's Iron and Steel Trades' Calculator, 382
Boileau's Traverse Tables, 424
Bulletin de l'Association Technique Maritime, 263
Catalogue of the Royal Naval Engineering College, Library, 468
Civilisation of Our Day; A Series of Original Essays by Expert Writers, The, Edited by James Samuelson, 382
Command of the Sea: A Story of Naval Administration, The Naval Engineer and the, by Francis G. Burton, 503
Corrosion and Fouling, and their Prevention, Metallic Structures: by John Newman, 180
Der Heere Flotten der Gegenwart, Vol. i., Berlin, 382
Directory of Railway Officials, The Universal, by S. Richardson Blundstone, 342
Docks, Southampton, Past and Present, 89
Draughtsmen's Work, Engineer, by a Practical Draughtsman, 180
Electrical Engineering as a Profession; How to Enter it, and Guide to the Engineering Profession, by A. H. Southan, 342
Electric Lighting and Power Distribution, Vol. i., by W. Perrin Maycock, 217
Engineer Draughtsman's Work, by a Practical Draughtsman, 180
Engineer's Handbook, The Practical, by W. S. Hutton, 342
Engineer's Pocket Book, The Mechanical, by D. K. Clark, 217
Gleanings from the Patent Law of all Nations, by W. Lloyd Wise, 89
Guide to the Engineering Profession, Electrical Engineering as a Profession How to Enter it, and, by A. H. Southan, 342
Howard Smith Line Handbook for Travellers, The, 46
How to Find Them, Latitude and Longitude, by W. T. Miller, 180
Ice-Making Machinery, Refrigerating and, by A. Wallis Tayler, 46
Iron and Steel Trades' Calculator, Aspin's, 382
Junior Saloon, The, 342
Know Your Own Ship, by Thomas Walton, 135
L'Aide Memoire de l'Officier, de Marine, 89
Latitude and Longitude, How to Find Them, by W. T. Miller, 180
Lean's Royal Navy List, 311, 382
Library Catalogue of the Royal Naval Engineering College, 468
Liners of the World, The Ocean, by W. Bellows, 88
Marine Engines, Steam Vessels and, by Foster Howell, 46
Mathematical Tables, The Spectator, by J. W. Gordon, 341
Mechanical Engineer's Pocket Book, The, by D K. Clark, 217
Mechanics Applied to the Requirements of the Sailor, Practical, by Thos. Mackenzie, 341
Mechanism of Men-of-War, The, by R. C. Oldknow, R.N., 134
Metal Workers' Instructor, The Sheet, by R. H. Warn and J. H. Horner, 179
Metallic Structures, Corrosion and Fouling, and Their Prevention, by John Newman, 180
Naval Administration, by Sir R. Vesey Hamilton, G.C.B., 179
Naval Annual, The, Edited by T. Brassey, 180
Naval Architects, &c., Tabulated Weights of Iron and Steel, For the Use of, by Chas. H. Jordan, 48
Naval Engineer and the Command of the Sea; A Story of Naval Administration, The, by Francis G. Burton, 503
Naval Pocket Book, The, 1896, by W. Laird Clowes, 88
Navy List, Lean's Royal, 341, 382
Ocean Liners of the World, The, by W. Bellows, 88
Original Essays by Expert Writers, The Civilization of our Day; A Series of, Edited by James Samuelson, 382
Patent Law of all Nations, Gleanings from the, by W. Lloyd Wise, 89
Photographer, The Junior, 342, 424
Photography and Photographers, 343
Pocket Book The Mechanical Engineer's, by D. K. Clark, 217
Pocket Book, The Naval, 1896, by W. Laird Clowes, 88
Power Distribution, Electric Lighting and. Vol. I., by W. Perrin Maycock, 217
Practical Engineer's Handbook, The, by W. S. Hutton, 342
Practical Manual, The Slide Rule, A, by C. N. Pickworth. Wh.Sc., 88
Practical Mechanics Applied to the Requirements of the Sailor, by Thos. Mackenzie, 341
Practical Photographer, 343
Railway Officials, The Universal Directory of, by S. Richardson Blundstone 342
Rays, The X, by Arthur Thornton, M.A., 263
Refrigerating and Ice-making Machinery, by A. Wallis Tayler, 46
Requirements of the Sailor, Practical Mechanics Applied to the, by Thos. Mackenzie, 341
Royal Naval Engineering College, Library Catalogue of the, 468
Royal Navy List, Lean's, 341, 382
Screw Threads and the Methods of Producing Them, by Paul M. Hasluck, 503
Sheet Metal Workers' Instructor, The, by R. H. Warn and J. H. Horner, 179
Shipping Directory and Handbook to Foreign Ports, The "A 1," 503
Ship, Know your Own, by Thomas Walton, 135
Single and Multiple Currents, Transformers for, by Gisbert Kapp, 503
Slide Rule: A Practical Manual, The, by C. N. Pickworth, Wh. Sc., 88
Smith Line Handbook for Travellers, The Howard, 46
Southampton Docks, Past and Present, 89
Spectator Mathematical Tables, The, by J. W. Gordon, 341
Steam Vessels and Marine Engines, by Foster Howell, 46
Tabulated Weights of Iron and Steel, for the use of Naval Architects, &c., by Chas. H. Jordan, 46
Torpedoes and Torpedo Vessels, by Lieutenant G. E. Armstrong, late R.N., 181
Trades' Calculator, Aspin's Iron and Steel, 382
Transformers for Single and Multiple Currents, by Gisbert Kapp, 503
Traverse Tables, by Major-General J. T. Boileau, F.R.S., 424
Universal Directory of Railway Officials, The, by S. Richardson Blundstone, 342
War, The Mechanism of Men of, by R. C. Oldknow, R.N., 134
Weights of Iron and Steel, for the use of Naval Architects, &c., Tabulated, by Chas. H. Jordan, 46
Workers' Instructor, The Sheet Metal, by R. H. Warn and J. H. Horner, 179
X Rays, The, by Arthur Thornton, M.A., 263

PATENTS, &c.

Board of Trade Examinations, Return of Engineers Reported to have passed Examinations under the Provisions of the Merchant Shipping Acts of 1854, 48, 92, 136, 184, 228, 272, 308, 344, 384, 434, 470, 506
Recent Applications for Patents connected with Marine Engineering, Ship Construction, and Mechanical Appliances for use in Ships, 47, 91, 135, 182, 227, 271, 307, 313, 432, 469, 505

PARAGRAPHS, NOTES AND NOVELTIES.

Accident to the French Tourist Steamer, The, 245
Activity in French Dockyards, 483
Admiralty Inspection, The, 156
Allan Line, The, 20
Almanac, White Star Company, 395
Aluminium, 9
American Competition, The, 246
American Contracts, 431
American Line, The, 449
American Purchase, An, 315
American Torpedo Boats, 320
Amusing Account, An, 314
Anti-Attrition Metal Company Limited, The, 47, 114, 434
Argentine Government, The, 71
Armoured Torpedo Destroyers, 371
Assembling for Instruction, 205
Atlantic Competition, New, 19
Atlantic Transport Company, The, 106
Atlantic Veteran, An, 104
Atlantic Weather, 246
Atlas Anti-Friction Metal, 470,
Austro-Hungarian Lloyd, The, 203
"Barrozo," Launch of the, 254
Battleships, The New, 212, 452
Belleville Boiler Abroad, The, 207
Bitumastic Enamel, 228
Blackwood & Gordon, Messrs., New Year's Book, 468
Blockade Running, 394
Bluejackets at a Tournament, 110
Boon to the Travelling Public, A, 281
Brassey's Naval Annual, 111
Breakdown, A, 313
Breaking up of old Ships, 448, 487
Brussels Exhibition and British Art, 414
Business Announcement, 496
Caddy & Co. (Nottingham), Limited, 47
Calls at French Ports, 204
Canadian Atlantic Service, The, 395
"Canadian Engineer," 297
Cape Liner, "Scot," The, 149
Carrier Pigeons in Naval Warfare, 206
Castle Line, The, 246, 313, 449
Catalogues, 414, 431
Changes in the Fleets, 20
Channel Fleets Inspection, 252
Chaplin's Koh-i-noor Self-Lubricating Packings, 468
Chatham Dockyard, 27, 66, 113, 206, 250, 288, 322, 363, 399, 452 482
Chief Engineer of the "Blake," The Late, 399
Civil and Mechanical Engineers' Society, 400

Civil and Mechanical Engineers' Society, Summary of Paper read before, the, 71
Close of the Manœuvres, The, 249
Clutha Composition, 436
Coaling Warships, 207
Collision in the St. Lawrence, The, 394
Columbia Ironworks, Baltimore, 296
Comparative Sea Power, 362
Commemoration of Trafalgar, The, 251, 320
Commissioned Ships of our Navy, The, 489
Common. Error, A, 487
Continental Express, The New, 134
Continental Service, The, 148
Consulting Naval Architect, A New, 278
Contracts for New First-Class Cruisers, 363
Co-operative Educational Travel, 204
Cost of Foreign Warships, 484
Cruises and Trial Trips, 112
Cunard Company, The, 203, 278
Cunard Fleet, The, 245
Curious Arrangement, A, 106
Daily Press, The, 487
Dangerous Paints on board H.M. Ships, 483
Delta Metal Co., Limited, 47
Designs of the Ships, The, 25
Devonport and Keyham, 27, 112, 251, 288, 363
Devonport Dockyard, 67, 206, 322, 399, 451, 483
Disasters, 393, 487
Distant Signalling, 206
Dock Accommodation at Antwerp, 393
Dominion Line, The, 104
Dredger for the East London Harbour Board, New, 179
Dredgers, 121
Earle's Shipbuilding and Engineering Co., Limited, 91
Electric Annealing of Armour Plates, 275
Electricity in the Navy, 111
Emperor of Russia's New Yacht, The, 60
Engineer-in-Chief and Naval Engineers, The, 112
Engineering Branch of the Naval Profession, 65
Engineer in Naval Warfare, The, 159, 398
Engineer Officers and the Estimates, 26
Engineers and Stokers in the Reserve, 66
Engineer's Feat, An, 355
Engineer's Heroism, An, 148
Engineers in Ships of War, 398
Engineers of the Royal Navy, 398
Engineer Students at Keyham, The, 67
Entry and Training of Engine-Room Staff, 65
Entry and Training of Naval Cadets, The, 25
Entry of Engineer Students, 159
Executive Titles for American Naval Engineers, 184
Expedition to Benin, The, 450
Explosion on Board the "Terrible," 112
Express Line to Canada, The New, 148
Fast Steaming on the Atlantic, 149, 203
Feedwater Heaters and Evaporators, 468
Fire at the Fairfield Shipbuilding Works, The, 184
Fleets of the Narrow Seas, The, 202
Fleets of the Sea Powers, The, 362
Fleming, Birkby & Goodall, Limited, London Representative, 47
Floating Dry Dock, 325
Floating Graving Dock, 434
Float-out of the "Mars," The, 68
Foreign Competition, 280
Fothergill Prize, 71
Fourth-class Ironclad "Odin," The, 358
French Naval Attache, 139
French Programme, The New, 364
French School of Naval War, 486
French Tourist Steamer's Accident, The, 203
French Types of Warships, 158
Furness, Sir Christopher, Westgarth & Co., Limited, 252
General Electric Co., The, 469
General Programme and Progress, 66
Goschen, Mr., and the Engineers, 361
Grand Manœuvres or Tactical Exercises, 156
Great Disaster, The, 147
Gunboat Flotilla on the Nile, The, 320
Gunboats for the Nile, 139
Habitual Regularity of Passage, 245
Hamburg Company's, The, "Augusta Victoria," 418
Hardware Dealers, 217
Harland, Sir Edward, The late, 315
Harrison Engine Co., Limited, The, 71
Health of the Navy, The, 482
"Himalaya" Troopship, The, 158
Hints on the Use and Care of Hydraulic Leathers, 168
Historical Records, 414
Holyhead Mail Boats, The Old, 394
Holzapfel's Compositions, 121, 468
Hopper Dredger, 168
Hopper Dredger Contract, 94
Hull and District Institution of Engineers and Naval Architects, Summary of Papers read before the, 47, 91
Ignorance of the Daily Press, The, 395
Imaginary Shipwreck, An, 247
Incombustible Plates for Warships, 504
Inflammable Gases on Shipboard, 468
Institute of Marine Engineers, 71
Institute of Marine Engineers, Engineering and Drawing Classes, 283
Institute of Marine Engineers' Meetings, 325
Institution of Junior Engineers, Summary of Paper read before the, 121
Institution of Junior Engineers, The, 504
Institution of Mechanical Engineers, 328
Institution of Naval Architects, 71, 483, 504
Institution of Naval Architects, Papers read before the, 121
Institution of Naval Architects, Summer Meeting 1897, 227
Intended Error, An, 488
International Ocean Race, An, 20
Iron and Steel Institute, 56
Iron and Steel Institute, Meetings in Spain, 228
Iron and Steel Works at Bogolowsky, 292
Iron Floating Pier, 434
Isolation and Impotence, 287
Italian Naval Council of Defence, An, 453
Japanese Government, 456
Japanese Mercantile Marine, The, 315
Japanese Warships, New, 208
Kellock, Messrs. C. W. & Co., 356
Kites for Naval Purposes, 453
"Koningen Wilhelmina," 59
La Compagnie Generale Transatlantique, 202, 314
Latest Castle Mail Packet, The, 279
Launches of French Warships, 322
Launches, Two, 355
Launching a French Cruiser, 158
Launch of an Italian Warship, 320
Launch of the "Cæsar" and "Illustrious," 288
Launch of the "Hannibal," 111
Launch of the "Saint Louis," 289
Laying the Keel of the "Ocean," 483
Lengthening a Record Breaker, 20
Lengthening of the "Augusta Victoria," The, 461
Lessons of the Manœuvres, 249
Letters to the Papers, 202
Library Catalogue of the Royal Naval Engineering College 468
Life Insurance and Pensions for Officers, 354
Light or Narrow Gauge Railways, 91
Liquid Fuel for the Navy, 364
Liquid Fuel in Foreign Navies, The use of, 482
Liquid Fuel in Germany, 289
Littoral Drift, 35
Liverpool Improvements, 104
Lord Kelvin Jubilee Celebration, The, 168
MacAndrew's Hymn, 354
Magnolia Metal, 254, 447
Manchester Ship Canal, 254
Manning of the Navy, The, 250
Man-of-War Launches, 27
Marine Engineers' Examination, 91, 341, 468, 504
Marseilles and Brindisi, 449
Mathematical, Surveying and Drawing Instruments, Catalogue of, 414
McDougall's Patent Mechanical Stoker, 261
Mechanical Handling of Goods at Riverside Premises, The, 71
"Montmorency," Launch of the, 79
Morison's Evaporators, Catalogue of, 431
Mosses & Mitchell, Messrs., 247
Most Wonderful Piece of News, The, 202
Move of the P. & O. Directors, The New, 245
Names of Our Warships, The, 158
National Line, Report, The, 489
Nation's Food Supply, The, 399
Naval Administration, 26
Naval Contracts and Contractors, 27
Naval Editors, Some, 246
Naval Efficiency, 450
Naval Engine-Room Complements, 287
Naval Expenditure in Germany and Italy, 400
Naval Mishaps, 320
Naval Mobilization, The, 205
Naval Movements, 364
Naval Officers and the Bluecoat School, 322
Naval Programme, The New, 24
Naval Works Bill, The, 26
Naval Works, Two New, 68
Navy and Lord Wolseley, The, 361
Navy Employment Agency, The, 252, 483
Navy Estimates in France, The, 399
Navy on a War Footing, The, 450
Navy Records Society, 159
Nederland American Line, The, 356
Needs of Naval Engineering, The, 111
New Departure, A, 314
New Steamers, 281
New York Harbour Facilities, 105
New York Mails, 395
New York Passage, The, 281
Nippon Yusen Kaisha of Japan, Messrs. The, 282
"Nomos" Compositions for Ships' Bottoms, 325
North-East Coast Institution of Engineers and Shipbuilders' Summer Excursion, 113
North-German Lloyd Company, The, 59, 246, 318
Notable Experiment, A, 204
Notice of Removal, Messrs. Mayne, Curson & Co., 217
"Ocean," Laying the Keel of the, 483
"Odin," The Fourth-class Ironclad, 358
Old Tonnage and New, 19
Our Fleets on Foreign Stations, 251
Pacific Steam Navigation Company, The, 488
Pacific Mail Lines, The, 314
Paddle *versus* Twin-screw, 487
P. & O. Co.'s Meeting, 393
P. & O. Co., The, 159, 356
"Paris," The, 419

Particular Service Squadron, The, 110, 363
Particulars of Messrs. Thos. Wilson & Co.'s Royal Mail, Passenger and Cargo Services, 204
"Patroclus," Launch of the, 79
Pembroke Dockyard, 27, 68, 113, 207, 252, 289, 323, 364, 400 453, 484
Penn & Sons, Messrs. John, 344
Pensions in the Merchant Navy, 371
"Perseverance," Launch of the, 79
Pigeons for New Purposes, 289
Plan of Campaign, The, 249
Port of the Future, The, 395
Portsmouth Dockyard, 26, 65, 111, 206, 250, 287, 323, 362, 398, 461, 482
"Powerful" and "Terrible," The, 156, 207, 250, 364, 452
Presentation to Mr. R. Wise, 168
Preserving Timber, 243
Protection Against Torpedo Attack, A New, 452
Provision of Officers and Men, The, 25
Publications, 20, 204, 247, 449, 488
Racing in Narrow Waters, 281
Real Facts, The, 489
Record Making, 203
Record of Sixty-nine Years, The, 362
Refrigerating Plant, 436
Remarkable Experience, A, 315
Rennie & Co., Messrs. G., 308
Report of the National Life-saving Society, The, 486
Rescue, A, 314
Reserve of Armed Cruisers, The, 148
Reserve of Ships and Men, The, 155
Re-starting of a Sunderland Shipyard, 71
Retiring from the Passenger Business, 277
Return of the Italian Visit, 156
Road Motors, 469
Rocks Ahead, 287
Royal Naval Reserve, The, 106
Royal United Service Institution, The, 398
Russian Fleet, The, 400
Russian Volunteer Fleet, The, 105
Russian Warship Construction, 323
Sailor's Heroism, A, 70
"Santa Fe," Torpedo-Boat Destroyer, 318
Scotswood Shipyard, 47
Shanks, Thomas, & Co., 275
Sheerness Dockyard, 27, 67, 112, 207, 251, 289, 322, 364, 400, 453, 486
Shipbuilding in French Yards, 453
Shipbuilding in Japan, 201
Shipbuilding Scheme, The, 25
Shipping News from Southampton, 69
Ships' Cabins and their Fittings, 47
Ships for the Argentine and Brazil, New, 158
"Slaney," Trials of the, 163
Social Gathering, A, 314
Some other Opinions, 288
Southampton and Queenstown, 356
Southampton and the Troops for the Cape, 70
Southampton Atlantic Steamers, The, 356
Spanish Shipbuilding, 484
Spanish Transatlantic Company, The, 278, 313
Speed Trials of the "Victorious" and "Prince George," 288
Steamship Amalgamation, The, 279, 315
Steamship Companies' Meetings, Several, 69
Steamship Company, A New, 148
Steam Trials in the British Navy, 323
Steam Trials of the "Powerful" and "Terrible," 452
Steam Trials of the "Renown," 66
Stewart's Compositions, 504
Story of Naval Administration, A, 398
Stowaway Nuisance, The, 450
Straits of Belle Isle, The, 05
Strike at Chiswick, The, 254
Subsidised Mercantile War Auxiliaries, The, 66
Supply of Engineer Officers, The, 68
Temperley Coaling Apparatus, 289
"Terrible" and "Powerful," The, 156, 207, 250, 364, 452
Tests for Belting Joints, 504
Thousand Pounds Pressure, A, 356
Tobin Bronze, 79
Torpedo-Boats, 414
Torpedo-Boat Destroyer "Entre Rios," 402
Torpedo-Boat Destroyers, 67, 110, 322, 414, 452
Torpedo-Boat Destroyers, More, 207
Torpedo Destroyers, The New, 71
Torpedoes and Torpedo Warfare, 112
Torpedo Flotilla, The, 205
Trades Union Congress and the Dockyard Labourers, The, 451
Training of Stokers, The, 400
Transfer of British Ships to Foreign Flags, The, 105
Travel to the Cape, 354
Trial of New Revenue Cutter, 414
Trials of the "Eclipse," 157
Trials of the "Majestic," 363
Trials of the "Santa Fe," 208
Trips to the Welsh Coast, 105
Trooping Season, The, 104
Unfortunate Mishap, An, 148
Union Line, The, 202, 314, 448
United Service Institution, 484
United States Naval Administration, 208
United States Navy, 156
United States Warships, The, 322
Vessels for the Atlantic Trade, The New, 246
Vessels Transferred to Foreign Flags, 184
Volunteer Fleet, The, 149
Vulcanised Fibre, 504
Water in the Boilers, 206
Water-tube *versus* Cylindrical Boilers, 482
West India Royal Mail Steam Packet Company, The, 393, 450
Wolga Steel Works, 490
Yarrow & Co., Messrs., 353

LAUNCHES AND TRIAL TRIPS.

LAUNCHES.

Aachen, 223
Ægusa, 427
Æon, 220
Aberdeen, 337
Activ, 427
Andria, 500
Adria, 169
Afghanistan, 462
African Prince, 218
Agatha, 298
Agnes, 83
Albertville, 82
Alert, 125
Alerto, 85
Alette, 169
Allinga, 464
Almirante Simpson, 82
Alster, 223
Altai, 335
Alton, 298
Amapu, 126
Amasis, 302
Amazonas, 425
Ammon, 222
Andalusia, 265
Anemone, 497
Annie Thomas, 221
Anping, 426
Antenor, 167, 223
Apollo, 373
Arabia, 378
Aragonia, 500
Ararat, 122
Ardath, 301
Argo, 38
Armenia, 219
Arranmoor, 463
Ashanti, 498
Ashby, 125
Ashton, 333
Asturia, 38
Atlantic, 171
Audaz, 499
Augsburg, 172
Auping, 378
Australia, 464
Avondale Castle, 355, 376
Ayr, 462
Aysgarth, 265
Bahdra, 427
Balderton, 265
Balgowan, 499
Bambro' Castle, 425
Barbara, 426
Barbarossa, 303
Barcelloe, 126
Barnesmore, 221
Barnsley, 333
Baron Innerdale, 83
Barrozo, 254, 298
Batoum, 333
Begona, 335
Belgica, 298
Bellasco, 39
Belvidere, 422, 465
Bengal, 298
Benton Castle, 218
Benvorlich, 172
Beraudan, 377
Beresford, Sir Chas., 425
Bhandara, 175
Bittern, 499
Bohemia, 303
Borgom, 170
Boxgrove, 123
Bradford, 337
Bravo, 38
Breese, 36
Brest Rock, 372
Brilliant Star, 83
Britannia, 138
British Trader, 300
Briton, 266
Bullionist, 218
Burma, 266
Cæsar, H.M.S., 288
Cambrian, 334
Canada, 120, 129
Candia, 377
Canning, 222
Capitan Munis Gamero 38
Cardiff, 375
Carham, 125
Carinthia, 169
Carl, 223
Carlo Alberto, 320
Carlow, 40
Castello, 375
Catinet, 322
Centaur, 301
Ceres, 375
Cervona, 302
Chameleon, 301
Chamois, 372
Charlotte Emily, 372
Charmian, 123
Chater-dag, 39
Chester, 372
Chile, 175
China, 167, 175
Chin-Kiang, 337
Chiriqui, 336
Chisholm Clan, 221
Christiana, 172
Christie John, 220
Christine, 464
Cidade de Manaos, 301
City of Glasgow, 427
City of Lincoln, 462
City of London, 462
City of Sparta, 339
City of York, 427
Clan Chisholm, 221
Clan Lindsay, 80
Clan Ogilvy, 300
Clan Sutherland, 333
Clarence, 37
Claudia, 498
Claverhill, 125
Clint, 221
Clio, 218
Cluden, 374
Clutha No. II., 222
Collingwood, 299
Commonwealth, 221
Comic, 167, 223
Comrade, 335
Condor, 298
Connemara, 377
Conqueror, 424
Continente, 83
Conway, 222
Corcovado, 264
Cornwall, 333
Cornwall, 375
Coro-Coro, 264
Corrientes, 371
Councillor, 333
Countess, 85
County of Fife, 174
Crater, 302
Creole, 267
Crux, 301
Cumbria, 266
Cygnus, 302
Dagmar, 169
Dalegarth, 425
Daniel-Erno, 83
Deccan, 499
Delphic, 465
Denton Grange, 172
D'Entrecasteaux, 158
Derby, 372
Devon, 375
Devona, 338
Devonian, 298
Dido, H.M.S., 27, 29
Don, 219
Dona Amelia, 218
Dona Catalina, 83
Donna Lucia, 222
Doris, H.M.S., 4, 27
Dorothy, 38
Dover, 375
Dresden, 374
Duchess of Devonshire, 497
Duchess of York, 173
Duneric, 377
Dunolly Castle, 355, 375
Dunraven, 299

Duns Law, 378
Dunvegan Castle, 83
Eastbourne, 375
Ebane, 38
Ebro, 336
Eclipse, 41
Eden, 425
Edith, 462
Ekuro, 335
Electra, 222
Ellen Rickmers, 36
Elizabeth Rickmers, 80
Eller, 80, 82
Elsie, 80
Elsie, 462
Elsie, 463
Ematru, 171
Emerald, 333
Emily Charlotte, 372
Emperor, 219
Emperor Nicholas II., 87
Equity, 41
Erandio, 425
Eronto, 129
Esmeralda, 82
Essex, 170
Eugenie, 376
Euphrates, 169
Europa, 169
European, 216, 223
Eversley, 300
Excelsior, 500
Fairport, 82
Falcon, 264
Falkirk, 266
Farringford, 170
Ficaria, 336
Fisher, Joseph, 300
Fisher Prince, 264
Fitzclarence, 463
Fitzpatrick, 37
Fleetwing, 222
Fleetwood, 378
Flintshire, 123
Francis Henderson, 337
Frontier, 172
Fuchsia, 333
Fujisan Maru, 464
Gaika, 338
Galatea, 372
Gallia, 426
Garmoyle, 427
Gascon, 296, 303
Gaulois, 322
Gerd, 374
Germaine, 83
Giang Seng, 85
Giavota, 39
Glasgow, 37
Glaucus, 126
Gleaner, 375
Glenholm, 175
Glenlee, 427
Glenpark, 499
Glenturret, 266
Gloxinia, 333
Gloxinia, 425
Golden Crown, 218
Goole, No. 10, 300
Goorkha, 465
Greenore, 264
Grimsby, 378
Guardian, 173
Gunhild, 333
Gunther, 223
Guvana, 337
Habil, 223
Hafnia, 303
Hakata Maru, 427
Hannibal, H.M.S., 111
Harald Haarfagre, 462
Haratio, 81
Harborne, 298
Harbury, 220
Harpenden, 373
Harrier, 462
Harwich, 378
Hawes, 378
Hawick Hall, 123
Heather Bell, 126
Helen, 126
Helena, 374
Heligoland, 303
Herbert, 303
Hermes, 122
Heronspool, 497
Herron, John, 174
Hesperus, 338
Hildago, 422, 428
Hillcrag, 220
Holyhead, 336
Holywell, 265
Honolulu, 40
Honoria, 123
Hornby, 173
Howe, 37
Huldra, 219
Huron, 298
Huskisson, 266
Hydrangea, 372
Ibadan, 83
Iberia, 171
Illustrious, H.M.S., 288
Ilorin, 267
Imperialist, 122
Inchmona, 37
India, 84
Indian Empire, 378
Indra, 464
Indraghiri, 39
Indravati, 41
Industry, 126
Industry, 299
Innisfallen, 169
Inyati, 337
Iolanthe, 169
Ipixuna, 427
Ipswich, 427
Isa, 372
Islander, 36
Isle of May, 129
Istrar, 42
Itaha, 267
Italy, 299
Itamby, 338
Itaya, 337
Ivan, 42
Ixia, 372
Jacinth, 298
Jacob Bright, 426
Jamaica, 80
James, 372
Japonica, 425
Jasper, 333
Jattra, 82
Jersey, 427
J. Leyman, 221
John Christie, 220
John Herron, 174
Jomsborg, 299
Joseph Fisher, 300
Juanita North, 124
Jubilee, 39
Jules-Leonie, 336
Jupiter, 41
Jupiter, 122
Jupiter, 425
Kamakura Maru, 422, 428
Kanegawa Maru, 338
Karthago, 264
Kawachi Maru, 464
Kazbek, 123
Keelung, 372
Kerry, 499
Kellie Castle, 126
Kendal Castle, 122
Kenneth Victor, 221
Kia Ora, 128
Killarney, 497
Kilrenny, 499
Kingfisher, 426
Kingston, 464
Kingswood, 171
Kinsale, 219
Kirkfield, 333
Kirkham, 174
Kirriemoor, 463
Kittiwake, 221
Konig, 267
Koningen Wilhelmina, 59
Lady Roberts, 464
Lady Wentworth, 128
Lakne, 302
La Mouette, 462
Lantana, 462
Langton Grange, 42
La Plata, 173
Lapwing, 298
Larchwold, 122
Laristan, 373
Latona, 123
Laurelwood, 80
Lavnia, 334
Leeds, 464
Leinster, 299
Leonard Spear, 338
Leonidas, 372
Leonie, 172
Leon Pauilhac, 500
Leopoldville, 373
Leyman, J., 221
Lily, 377
Lindley, 336
Liv, 265
Livramento, 82
Lobelia, 264
Lockwood, 298
London City, 126
Loongmoon, 82
Lord Dufferin, 42
Lord Kelvin, 123
Lord Nelson, 497
Lord Warden, 337
Lord Wolseley, 266
Lough Mahon, 222
Lourenco, 301
Lucania, 21
Lucern, 425
Luigia Premuda, 221
Lupus, 302
Lynrowan, 41
Lynx, 337
Lyster, 337
Maceio, 220
Magician, 296, 338
Memoria, 174
Magnolia, 497
Mantinac, 127
Margarita, 41
Margarita, 174
Margate, 464
Marguerite Depeaux, 464
Maria, 126
Marie, 376
Marie Louise, 333
Maritta, 36
Mars, H.M.S., 68
Mars, 220
Mary, 462
Mary A. Short, 218
Maud Cassel, 462
Mayflower, 377
Meteor, 128
Midas, 80
Milwaukee, 373
Minerva, 427
Minho, 222
Mosna, 464
Montmorency, 79
Moorby, 218
Mount Sephar, 84
Munster, 336
Musselcrag, 172
Neidenfels, 375
Nelson, 80
Neptune, 128
Netherfield, 81
Newhaven, 499
Niobe, H.M.S., 477
Ninette, 218
Nitocris, 372
N. J. Fjord, 128
Norah, 462
Norden, 81
Norman, 378
Norman Isles, 169
Novorossisk, 298
Nyanza, 464
Oakburn, 498
Oakby, 462
Oberon, 170
Oceano, 264
Ogun, 125
Ohiwa, 498
Oilfield, 124
Olaf, 497
Olwen, 298
Onipenta, 221
Oolobaria, 337
Oratava, 373
Oravia, 428
Oriel, 497
Orion, 80
Osborne, 462
Oscar II., 372
Ostero, 462
Othello, 265
Owenabuee, 426
Owenscurra, 464
Owl, 80
Oxford, 499
Pannonia, 172
Paqueta, 300
Paramaribo, 223
Paris, 337
Parmelia, 175
Parthia, 38
Patroclus, 79
Pearl, 266
Pendeen, 10
Penguin, 334
Pennsylvania, 296, 303
Perseverance, 79
Perseverance, 122
Peru, 302
Peterborough, 499
Petrel, 497
Pisa, 378
Pointer, 42
Polhous, 498
Polycarp, 39
Port Denison, 334
Portodi Scio, 80
Portugal, 266
Premier, 264
Primula, 426
Prince, 37
Prince Arthur, 127
Princess, 336
Princess Clementine, 339, 461
Principessa Christiania, 218
Priscilla, 301
Prometheus, 40
Prudente de Moraes, 124
Pursuit, 123
Quarta, 85
Queen Cristina, 220
Queen Eleanor, 220
Queenstown, 500
Radley, 37
Raglan Castle, 449, 465
Ragnar, 124
Redwing, 222
Reindeer, 170
Restauracion, 128
Richmond, 500
Rickmers, Elizabeth, 80
Rickmers, Ellen, 36
Rijnstroom, 336
Rio, 129
Rio Affua, 301
Rio Muaco, 375
Rob Roy, 174
Rookwood, 264
Rosabelle, 500
Rosemount, 170
Rotterdam, 266, 500
Rover, 497
Rubicon, 122
Russia, 169
Saint Mary, 374
Sairina, 463
Sandbeck, 173
Sapphire, 336
Sapucaia, 82
Savan, 298
Scarborough, 500
Scottish King, 331
Serpolette, 128
Seti, 171
Sevastopol, 169
Shadwell, 36
Sheepvaart, 169
Short, Mary A., 218
Sigurd, 80
Simonside, 81
Sir Charles Beresford 425
Sir Evelyn Wood, 41
Sir John Coode, 127
Sivert Nielsen, 223
Skomer, 39
Slaney, 174
Sleuthound, 497
Smiling Morn, 39
Socotra, 425
Sorata, 497
Southend Belle, 41
Speedy, 85
Sparo, 172
Spray, 499
St. Agnes, 219
Staintondale, 219
Star, 252
Star of Hope, 375
Start, 129
St. Elvies, 83
St. Hilda, 463
St. Johann, 303
St. Lawrence, 81
St. Louis, 289, 308
St. Vincent, 41
Sunningdale, 333
Surf, 82
Sui Wo, 302
Sussex, 127
Svino, 462
Sybarite, 464
Tadorna, 298
Taishun, 427
Takao, 463
Talisman, 37, 83
Tamsui, 425
Taormina, 173
Taquary, 123
Tarpon, 266
Tartar, 41
Taymount, 499
Tehuantepec, 301
Teniente Serrano, 125
Terror, 302
Tetuan, 377
Theben, 429
Themis, 126
The Victor, 375
Thomas, Annie, 221
Thornhill, 463
Thornley, 171

Thornliebank, 301
Thrunscoe, 37
Tintagel Castle, 301
Titania, 122
Topaz, 377
Toronto, 38
Trafford, 267
Trevose, 39
Trinidad, 300
Troja, 335
Trojan Prince, 125
Truma, 80
Trunkby, 335
Trusty, 372
Tunstall, 498
Turquoise, 298
Turret Chief, 299
Turret Court, 300
Tutanekai, 129
Tynemouth, 425
Ulster, 218
Umguza, 169
Umooti, 80
Umtali, 37
Unique, 300
Urania, 374
Vanilla, 462
Varuna, 222
Venus, 221
Venus, 335
Vera, 334
Verne, 123
Verona, 482
Vestra, 464
Veva, 122
Victor, 497
Victoria, 174
Victorian Era, 463
Victor, The, 375
Ville de Cayenne, 169
Ville de Cette, 333
Vingard, 39
Violet, 264
Virgil, 83
Vlug, 463
Volga, 222
Vulcan, 299
Waimate, 220
Wakatere, 173
Westfield, 39
White Cross, 124
White Cross, 333
Wilberforce, 462
Wilhelmina, 82
Willscott, 337
Wingrove, 298
Winnie, 372
Yashima, 36
Yearby, 374
Ymer 82,
Yoog, 171
Yorke, 38
Yucatan, 267
Zapad, 218
Zero, 38
Zero, 122
Zuid Holland, 171

VESSELS NOT NAMED.

Chilian Cruiser, 172
Dredger, 465
Hopper Barges, 301
Hopper Dredger, 337
Iron Lighter, 333, 498
Iron Steam Tug, 122
Nos. 130, 373
Ocean Barges, 299
Pontoon Dock, 81
Sea-going Barge, 333
Sea-going Lighters, 425
Spar Deck Steel Screw Steamer, 81
Steam Ferryboat, 498
Steam Hopper Barges, 41, 83, 127
Steam Trawlers, 220
Steam Yacht, 266
Steel Barges, 221, 464
Steel Coal Barges, 124
Steel Lighters, 374, 426
Steel Screw Steamers, 81, 125, 222, 299, 333, 334
Steel Screw Tugs, 173, 174
Steel Towing Vessel, 124
Three Masted Schooner, 298
Torpedo-Boat for Argentine Government, 108
Turret Steamer, 80
Twin-Screw Steamer, 42

TRIAL TRIPS.

Adria, 268
Aeon, 268
Affonso d'Albuquerque 466
Afghanistan, 502
Albertville, 224
Alette, 225
Algoa, 45
Almirante Simpson, 204
Anping, 501
Ardova, 380
Arranmoor, 502
Ashby, 178
Asturia, 175
Atlantic, 226
Atlas, 44
Australian, 43
Avondale Castle, 466
Aysgarth, 304
Balderton, 304
Balmoral, 85
Bangalore, 86
Barcellos, 175
Baron Innerdale, 175
Begona, 430
Bellailsa, 42
Bengal, 340
Berandan, 430
Berkshire, 87
Borjom, 267
Boxgrove, 178
Britannia, 179
British Trader, 378
Calais, 42
Cambrian, 466
Canada, 318, 339
Canning, 306
Capitan Munos Gamero, 340
Capitan Orella, 340
Carlow, 133
Casuarina, 468
Cestrian, 34
Chiriqui, 380
Christine, 467
Chun Sang, 44
Clarence, 87
Claverhill, 179
Cluden, 465
Clutha No. II., 226
Connemara, 468
Conqueror, 501
Continente, 176
Corcovado, 305
Cornwall, 379
Corocoro, 305
Culzean Castle, 86
Cumbria, 378
Denton Grange, 298, 303
Dona Catalina, 132
Dorothy, 87
Douro, 43
Duchess of York, 224
Donolly Castle, 467
Dunraven, 340
Ebani, 87
Ebro, 429
Eclipse, 157
Ekuro, 380
Elisabeth Rickmers, 133
Eronto, 178
Eugenia, 466
European, 480
Falcon, 304
Fau Sang, 43
Fitzclarance, 501
Fitzpatric, 86
Flintshire, 176
Folsjo, 42
Francis Henderson, 341
Furor, 379
Gallia, 502
Gamroyle, 466
Gerd, 466
Glengoil, 87
Glenlochy, 86
Glenturret, 304
Golden Fleece, 44
Golden Fleece, 226
Greylands, 43
Gunther, 339
Harborne, 340
Harbury, 303
Hardy, 177
Hermes, 176
Herron, John, 178
Hillbrook, 44
Holywell, 305
Huascar, 43
Ibadan, 130
Inchmona, 131
Injeniero Hyatt, 502
India, 304
Innisfallen, 268
Inyati, 379
Iolaire, 45, 86
Iona, 270
Islander, 85
Italy, 382
Jacob Bright, 502
Jamaica, 87
Jattra, 129
John Christie, 304
John Herron, 178
Juanita North, 225
Jupiter, 133
Jupiter, 177
Kanagawa Maru, 430
Karthago, 334
Kathleen, 177
Kelvin, 130
Kherson, 133
Kia Ora, 178
King Edgar, 45
Kingtor, 42
Kirkfield, 378
Kirkham, 225
Kirriemoor, 502
Kylemoor, 44
Langton Grange, 176
La Plata, 269
Larchwold, 177
Laristan, 429
Latona, 179
Leitrim, 132
Leonidas, 468
Leopoldville, 500
Lily, 465
Liv, 304
Lobelia, 307
Loongmoon, 175
Lord Kelvin, 177
Lorle, 86
Lourenco, 339
Lucania, 270
Luigia Premuda, 271
Lulmira, 501
Lynrowan, 130
Maceio, 305
Majestic, H.M.S., 363
Malvina, 45
Margarita, 87
Margarita, 269
Maritta, 45
Mars, 269
Mary Ada Short, 269
Mataura, 88
Mayo, 379
Milwaukee, 467
Minneburg, 87
Misiones, 371
Moorby, 227
Narrung, 306
Neptune, 226
Nitocris, 429
Norden, 133
Norman, 381
Nubia, 340
Oceano, 340
Ogun, 133
Oilfield, 178
Okinawa Maru, 87
Oratava, 501
Osborne, 468
Owl, 130
Pannonia, 270
Parmelia, 225
Peru, 379
Pointer, 130
Powerful, H.M.S., 364, 452
Presidente, 430
Prince George, H.M.S., 288
Princess, 379
Princess of Wales, 270
Prudente de Moraes, 178
Quarta, 175
Queen Eleanor, 269
Radley, 129
Ragnar, 178
Rakanoa, 87
Rameses, 305
Regina, 429
Renown, H.M.S., 64
Restauracion, 225
Rickmers, Elisabeth, 133
Rio Affua, 339
Rijnstroom, 381
Rolando, 175
Rosefield, 86
Rosemount, 223
Rotterdam, 304
Santa Fé, 208
Sapucaia, 130
Sardonyx, 269
Savan, 341
Scud, 132
Selma, 86
Sigurd, 132
Simonside, 177
Sir Evelyn Wood, 176
Sir John Coode, 131
Slaney, 163
Socotra, 501
Southend Belle, 131
Speedy, II., 224
Spero, 225
St. Austell, 44
St. Elvies, 133
St. Hilda, 500
St. Ives, 46
St. Lawrence, 130
St. Mary, 465
Sussex, 227
Tadorna, 339
Takao, 501
Talbot, H.M. S., 112
Talisman, 176
Taormina, 269
Taquary, 227
Tehuantepec, 341
Teniente Serrano, 430
Terrible, H.M.S., 364, 452
Theben, 500
Thornley, 268
Thrasher, 468
Tintagel Castle, 331
Treasury, 43
Trojan Prince, 270
Tropic, 43
Truma, 178
Trunkby, 380
Tutanekai, 223, 276
Umvoti, 306
Unique, 381
Unison, 430
Urania, 431
Valhalla, 46
Varuna, 380
Veva, 175
Victorious, H.M.S., 2[illegible]
Virago, 380, 429
Wakatere, 303
Walter Q. Gresham, 414
Wilhelmina, 177
Wingrove, 340
Winnie, 429
Yearby, 430
Yucatan, 339
Zero, 224
Zuid Holland, 268

VESSELS NOT NAMED.

Steam Hopper Barge, 132
Steel Screw Tug, 227

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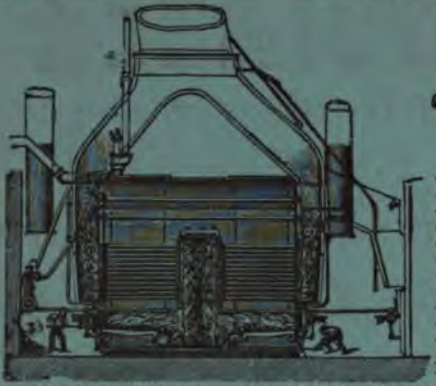

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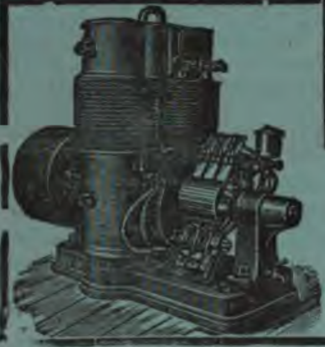

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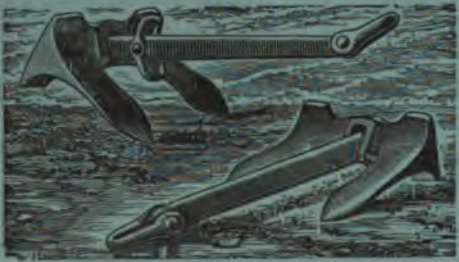

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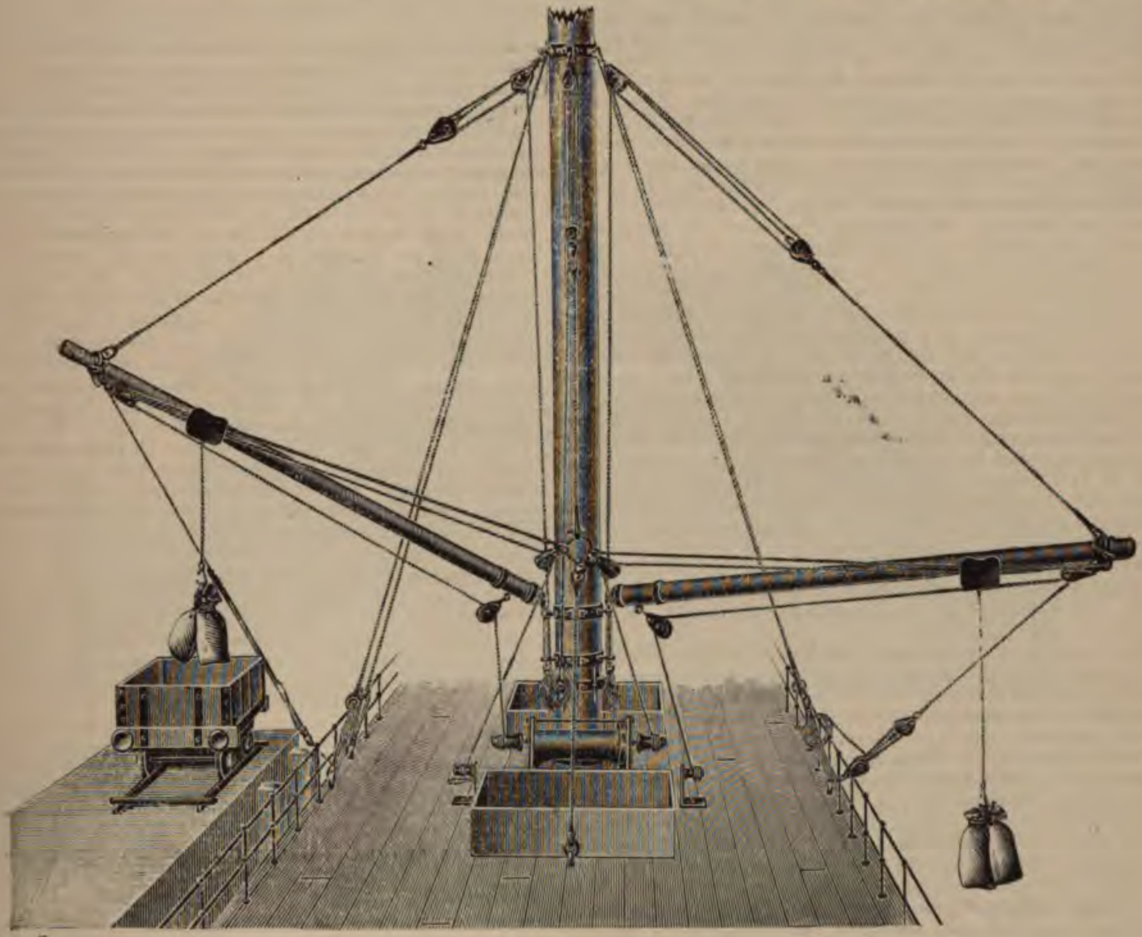
SOME months back we expressed an opinion that there was not at that time any approved system of watertight doors extant, which would give the necessary immunity from danger in the hurry and confusion of an unexpected accident, and which at the same time would be free from almost insuperable objections in use. We see that this opinion is practically confirmed by two papers read upon this subject before the Institution of Naval Architects. One of these is the contribution of Lord Charles Beresford, who characteristically cuts the knot of the difficulty by the suggestion that watertight doors of any kind are to be looked upon as an evil, even if unavoidable in certain cases, and that the number should be considerably reduced as compared with the modern practice in war vessels. He epigrammatically defines the watertight door to be a compromise between the safety of the ship and the convenience of the department, and considers the departments ought, as far as convenience may go, to give more way to the safety, as it has so often been proved that the doors are invariably open when an unforeseen contingency occurs. The examples of the *Victoria*, the *Re d'Italia*, the *Vanguard*, the *Grosser Kurfurst*, and the *Blanca Escalada* are fresh in our memories, and it was reported in each case that had it been possible to close the doors in time, the ships would have been saved. Lord Beresford believes it to be a fact that no ship has been saved when wounded below water level at a moment when her watertight doors were open, and we cannot contradict him. Hence, he argues, is the danger of her having the doors at all. He tells us that the French have almost entirely done away with water-tight doors in their new ships, and he therefore ventures to advise that there should be no doors at all below water-line in the bulkheads which enclose the engine-room and boiler-room compartments, which form the belly of the ship, that is the great floating power from which she gets her buoyancy. Immediate communication between the engineer officer and his subordinates would, he thinks, be satisfied by quick, verbal communication, and after personal transit from compartment to compartment, could, he thinks, be obtained through doors above the water-line. The next most important place in which there should be no doors at all is, he thinks, in the collision bulkhead, and in the next bulkhead aft, and that the only access necessary to the foremost compartment should be by he manhole in the deck above. The collision bulkhead would be better further aft, so that it should be quite clear of all the strengthening pieces supporting the ram; it should be more strongly fitted than at present, and should be rounded like a barbette, instead of being at right angles to the side. In the case of such doors as are absolutely necessary, the proposal is that they should be modified into smaller rectangular openings close to the deck at the top of the bulkhead, to which access could be had from the floor of either adjoining compartment by a short ladder. The result of the carrying out of this proposal would be that in each compartment that had doors the water would meet with five, six, or more feet of bulkhead all round, which would confine any sudden inrush of water in the one wounded compartment for an appreciable time to enable the doors to be closed upon it, and the sudden rush of water from compartment to compartment, as at present takes place when the sills of the doors are down to the floor, would be avoided. Lord Beresford is aware that this removal of doors might materially affect the ventilation of compartments as at present relied on, but he considers that point could easily be met by special mechanical arrangements, if faced.

COLONEL N. SOLIANI, Director of Construction of the Royal Italian Navy, considers that in the matter of watertight doors we may have something to learn from our neighbours, and though not going so far as Lord Charles Beresford in desiring to avoid them as much as possible, despite loss of comfort or convenience, he details many suggested improvements in form to make them more reliable and prompt in action. He distinguishes, however, between doors which should always be normally closed and only opened for special occasions, to be immediately closed thereafter, and those doors which are constantly being used. In the former case he considers hinged doors are suitable, as making, when time is not urgent, the most reliable form of watertight joint. In the latter case he considers the doors must be sliding, and prefers the door to close by falling vertically by its own weight, and operated by a brake screw gear for lifting. The release of the brake disengages the lifting gear to allow the door to fall, which can thus be checked in its fall. The main difficulty, however, in sliding doors, is to make a reliable watertight joint, particularly against water pressure from either side, and Signor Soliani advocates a double door, making an automatic water joint either way by pressure from either side. The bunker doors are a still more difficult problem to ensure tight closing, as so often coal lies upon the threshold just where the lower edge of the door should make a joint. The Colonel proposes to overcome these difficulties by raising the bunker aperture some distance above the bottom of the bunker, and a foot or more above the floor of the stokehold. Coal could not thus rest on the threshold, and even if there, would be lifted and thrown down by the rising door, which might have a bevelled edge for the purpose. Although it is easy to devise automatic gearing, either electric or hydraulic, by which the doors might be immediately closed by the officers on deck in emergencies, the awful fate of a sailor or stoker caught under such closing door, and actually confined by its closure in either the coal bunker or a flooded compartment, will, we fear, stand for a long time in the way of such arrangements being adopted, or if adopted, in being promptly or efficiently worked when needed, so we are inclined to fall back upon Lord Charles Beresford's idea to ascertain how many doors through bulkheads can be dispensed with entirely.

In the estimation of the stability of ships in still water, the development and latest outcome of geometrical solutions are well set out by Mr. J. Bruhn. He traces the first conception of geometrical analysis as to the problems of stability from Bougner, who first discovered the meta-centre, and defined its properties and importance , to Euler and Dupin, the latter of whom Mr. Bruhn credits with complete exploration of the geometry of the subject. He traced the movement of the centre of buoyancy under all conditions, and defined the character of the surface traced by it. Mr. John, Dr. Elgar and Professor Jenkins followed these geometrical investigations to further development, and were followed by others. Based on the geometrical work of these investigators, Mr. Bruhn sets himself the task to work out certain propositions, the first of which is—To construct geometrically a set of cross-curves of stability for inclinations from 90 deg. to 180 deg. when we know the corresponding curves for inclinations from 0 deg. to 90 deg. The second is—"To determine the direction in which the centre of buoyancy moves when the ship is inclined in a given direction," and he follows with investigations of lines of curvature and geodetic lines as curves of buoyancy and relations between the surfaces of buoyancy and floatation. These propositions are worked out with great clearness, and with reference of course to geometrical figures and constructions, which are the essence of the investigation.

The estimation of the stability of vessels under all circumstances, and the determination of the periodicity and amplitude of the rolling of vessels in a synchronous or disperiodic swell, have given a large field for the close investigation of mathematicians, and the Institution of Naval Architects would do less than honour to its functions were it not to give to the world at large, through its members, great accessions to the knowledge in such subjects, though the matter is rather too deep for the general reader. Mr. R. E. Froude is a worthy successor to his father in further developing such mathematical investigations, and is not to be outdone by the eminent French savant, M. Bertin, in the abstruse calculations as to the non-uniform rolling of ships, that is, the rolling on a non-synchronous or disperiodic swell. We are glad to see, however, that Mr. Froude in his paper does not merely give closely analytical investigations in these matters, but, for the benefit of those who try to follow him, puts his results in plain verbal propositions, embodying in as simple a manner as possible a comprehensive view of the theorems at which he has arrived. These are, first—"In an isochronous resisted ship, rolling under the influence of any swell whatever, the difference in the rolling due to any difference in initial angle and angular speed, consists simply in the superposition of a corresponding still water, or (as it is termed), free oscillation." This leads to a second general proposition, thus—"In an isochronous unresisted ship, rolling under the influence of a swell, consisting of any kind of truly recurrent undulations, the rolling will consist of the uniform forced oscillation proper to these undulations, with or without a free oscillation superposed." On this follows the consideration of resistance upon such non-uniform rolling, which leads to the following conclusion. That the "free" oscillation becomes the resisted still water oscillation, or in other words, the familiar "extinction diagram." The differences of a resisted forced oscillation from the unresisted may also be defined as an alteration of phase which precedes or follows that of the unresisted in a definable degree, and could be dealt with under the first and second propositions. The following characteristics of results in resisted rolling are also very general—(*a*) however non-uniform initially, the rolling ultimately falls into the uniform forced oscillation; (*b*) it does so the sooner, *cæteris paribus*, the higher the resistance; (*c*) the fewer the cycles or alternations of amplitude of rolling, the more nearly synchronous the swell of the ship; (*d*) the amplitude of the uniform rolling is an approximate mean of the alternate maxima and minima of the precedent non-uniform rolling; (*e*) if the rolling starts from zero, the maximum amplitude falls short of twice the ultimate uniform amplitude; (*f*) and the more so the higher the resistance; (*g*) and the more nearly synchronous the swell; (*h*) in a synchronous swell the maximun amplitude cannot exceed the ultimate uniform amplitude unless it does so initially. In practice, however, it has been found that the ideal assumed uniformity of swell does not exist. Hence, in proportion as on the one hand the resistance is small, and initial non-uniformity of rolling dies hard, and on the other the non-synchronism is considerable, and the alternations of amplitude rapid, the continual fresh disturbances due to non-uniformity of swell avail effectively to maintain non-uniformity of rolling in spite of the tendency of resistance to eradicate it.



TYZACK'S IMPROVED CARGO GEAR.

We have pleasure in presenting to our readers the above illustration showing the working of the improved gear for loading and discharging steamers and sailing ships, and for use also at wharves, warehouses, &c., which has been introduced by Mr. George Tyzack, the well-known anchor patentee and manufacturer, South Shields. Mr. Tyzack has, for years, given very close attention to this subject, and we believe that in the present gear he has perfectly realized the object he had in view, which was the removal from one position to another of packages and heavy weights generally, with the minimum expenditure of time and labour. Though the gear is adaptable to any purpose involving the lifting and depositing of goods, it it particularly suitable to ship-loading and discharging, in connection with which work the saving of time is often a matter of the greatest consequence. We are informed that cargo can be worked with this gear in half the time, with the same number of hands—and even with fewer hands—required under the old system. This valuable quality of time and labour saving has, indeed, already been adequately tested by working some thousands of tons of general cargo on a large liner, to whose owners reference can be given. The gear, it may be added, can be easily and quickly rigged into position by any seaman, and can be worked upon ordinary booms or upon outriggers. For light goods, say up to a ton or 30 cwt., single purchase may be employed to enhance speed of working, the double purchase being resorted to when heavier lifts are required. The cargo runner used may be either rope or chain. Cargo when traversing travels in a direct line from headroom over hatchway to the required distance over vessel's side, and traverse is materially assisted by weight of cargo acting automatically either in loading or discharging. Cargo can be lowered to deck for examination or weighing at any point of transit, and as many as four sets of gear (or more if length of hatchway permit) can be worked at one hatchway. The block shells are made in wrought steel, with phosphor bronze bushed sheaves, and tempered steel pins. We need only add that this apparatus, having no "catch gear" to go wrong, cannot very well get out of order, and that consequently there is in connection with it an almost complete immunity from the petty troubles and annoyances that are usually attendant upon other systems of cargo removal.

LAUNCH OF H.M.S. "DORIS."

ON March 3rd the Naval Construction and Armaments Co., Limited, launched from their shipbuilding yard at Barrow-in-Furness H.M.S. *Doris*, being the second of the two twin second-class cruisers which they are at present building for Her Majesty's Government. She is exactly a sister ship to the *Juno*, launched a couple of months ago, a full description of which appeared in the MARINE ENGINEER at the time. The launching ceremony was performed by the Hon. Miss Hood, daughter of Admiral Lord Hood, of Avalon. The launch, which took place on a very stormy day, was perfectly successful, and the vessel was afterwards docked and placed under the 100-ton crane alongside the *Powerful* and the *Juno*, where she will receive her engines, boilers, and general fittings. Subsequently to the launch, Mr. Adamson, the managing director of the Naval Construction and Armaments Co., proposed "Success to H.M.S. *Doris*," and referring to the new Naval programme, said: "The First Lord had mentioned that the vessels now building, and those to be built under the new scheme had to be finished in about three years. The shipyards in this country were capable of doing this and a great deal more if they could get the chance. He read an interesting article the other day in a newspaper which reported very closely on all nautical matters, comparing the strength of the Navy at the present time with its strength about six years before the Naval Defence Act was passed, and showing by figures that the strength of our Navy had been doubled during this time, not only in the number of ships, but in their power and their speed, and so on, and he had no doubt if it was required to again double the Navy they could do it in a comparatively short time. He would not detain them any longer but he hoped it would be many a day before the *Doris* was called into action; but there was no doubt if that time ever came she would be found equal to the work, and would uphold the honour of her country and be a credit to her builders."

Mr. Adamson then proposed the health of the Hon. Miss Hood, and in reply, Admiral Lord Hood begged to thank them most heartily for the kind manner in which they had received the health of his daughter. He could assure them that it gave her the greatest pleasure to perform the ceremony of christening to the cruiser which had been so successfully launched that day. He was quite sure that the rapid and most satisfactory manner in which the *Doris* and her sister ship, the *Juno*, and also that magnificent first-class cruiser, the *Powerful*, in addition to many other war vessels built there, all of which reflected the very greatest credit on the Barrow Co. If this country happened at any time to be engaged in war, these vessels, with their high speed and great power, would prove of extreme value in assisting to protect our sea-borne commerce, which was far greater than that of the whole of the rest of the world combined, and so retain the prosperity of the British Empire. Now he considered it a point of very great importance that in addition to the royal dockyards they had in this country such thoroughly competent private shipbuilders as the Naval Construction and Armaments Co., and others in different parts of the country, who possessed the power and ability to greatly and rapidly increase the strength of the Navy, and if an emergency should arise such as often happened from sudden and totally unexpected circumstances such as had happened the other day, when the nation was thoroughly awakened to the absolute necessity of this country maintaining her command on the sea, that emergency could be met. They had not only to protect their vessels in all parts of the world, but the very extensive British Empire as a first-class Power depended upon the Navy. He thought it was a wise policy that was adopted by the last two Governments in strengthening the Navy, and he was glad to see that the Navy at the present time was now in a better preparation for war than it had ever been previously in his recollection. When they looked at the manner in which foreign navies were increased, and were still being added to, he felt that if Britain had to maintain her command of the sea much still remained to be done. He was thankful to read in the programme of the Estimates of the Lords of the Admiralty, laid before the House of Commons, on the previous night, that it was proposed to increase the Navy by five first-class line-of-battle ships 13 cruisers, and 28 torpedo-boat destroyers. Of these vessels, three battleships and two cruisers only were to be built in the Government dockyards, and the rest were to be built by contract. He hoped, and he was sure all those present would join him in thinking, that a fair proportion of these vessels would be ordered from the Naval Construction and Armaments Co. In conclusion, he could only express his own feelings and those of everyone present when he wished success to the Naval Construction and Armaments Co.

Admiral Boys said they had just heard from Admiral Lord Hood an exposition of what was the position of the Navy, and no one was better able to judge of that than Admiral Lord Hood, who had been for so long connected with the Admiralty. In the name of the Naval Construction and Armaments Co., he had first to regret the absence of the Duke of Devonshire, who, owing to his exalted position in the Government, had necessarily given up the chairmanship of this company. They all regretted this, and Barrow people, who knew his Grace perhaps better than he did, but they were in hopes that in a very short time the chairmanship would be filled up by a very capable gentleman. Now, with regard to the *Doris*, so successfully launched that day, he thought it might interest some of them to know what was the meaning of the word. He confessed he did not know, but he took the trouble to make some inquiries, and had found out that *Doris* was a marine divinity. She was the daughter of Oceanus and Thetis, and the mother of Nereides. The Latin poets sometimes called the sea Doris, and he presumed this was the connection between the British frigates and the name of *Doris* in the past and the sea itself. He found in 1798 a British frigate of 36 guns captured on the coast of Ireland a French frigate, *Hoche*, and consorts. In 1803, they found the *Doris* captured a French lugger, which kept up a running fight for seven hours. In 1806, the same frigate was wrecked on the coast of France, while in 1820, a 42-gun frigate of the same name was building at Portsmouth, and he had not heard much of her since. Probably she was broken up. These were all wooden ships, but the ship they had launched that day had very little wood in her. She was built of steel and iron, and as Mr. Adamson had told them, was five times larger than those he had mentioned. She had been launched by a lineal descendant of Admiral Lord Hood, of great naval fame, and the daughter of his friend, Admiral Lord Hood, to whom the Navy owed much of its efficiency, owing to his connection with the Admiralty and his knowledge of the naval service. The *Doris* had been put into her natural element by the daughter of a family famous for its great deeds, and the occasion gained importance from the fact that a Hood had done another good work in the direction of improving the Navy. He concluded with complimentary references to Mr. Gowan, Mr. McKechnie, Mr. MacGregor, Mr Buchanan, and the other lieutenants of Mr. Adamson, who contributed so much to the success of the Naval Construction and Armaments Co.

BLUE ASBESTOS.

THIS material having all the valuable properties of ordinary asbestos as a refractory and non-heat-conducting substance, has certain unique qualities of its own. It is blue in colour, is considerably lighter than other asbestos, and the fibre is longer and stronger. It is found in Cape Colony on farms acquired by the Cape Asbestos Company, Limited, of 8, Minories, London, E.C., which company has been formed to develop this useful mineral and bring it into general use.

By special treatment and machinery fine wool is obtained from it of quite half the specific gravity of the finest wool obtainable from other asbestos, and so tenacious and pliable that it can be spun into very fine yarn of great tensile strength eminently adaptable for weaving into cloth, or for netting, twine or ropes, which are uninflammable, rot and acid-proof, and unaffected by atmospheric or climatic influences. It is most probable, therefore, that this blue asbestos will open markets for applications in many ways where ordinary asbestos has been unsuitable on account of insufficient strength. We are, however, particularly interested in its adaptation to marine boiler covering in the form of mattresses made of blue asbestos cloth stitched together, and the space between filled with blue asbestos fibre.

This covering has been adopted almost exclusively by the French and Italian Navies, and it is coming rapidly to the front in this country in the Mercantile Marine. It is said to be the best non-conducting covering, and is certainly the most convenient, as it can be readily removed and replaced to examine or repair the boiler.

It may not be so generally known as it ought to be, that the rapid deterioration of both single and double cellular bottoms under the boilers is due largely to the unprotected condition of the under sides of the boilers where cement lagging cannot conveniently be applied. The exciting cause of the serious deterioration is no doubt the excessive temperature caused by the adjacent unprotected boiler shell which leads to rapid chemical combustion or oxidation of the iron of the hull bottoms under the boilers.

This blue asbestos mattress covering applied to the bottom of boilers, is the best method yet devised of coping with this evil, and preventing the oxidization on the boiler tanks.

It may well be deduced that if the temperature affecting the shells under the boilers were not more than the normal temperature of ballast tanks, no more corrosion need take place in theone case than it does in the other, and which is practically *nil* in the ordinary life of the ship.

We have been favoured with the results of tests as to the high efficiency of the blue asbestos mattresses as applied to the unprotected under sides of the boilers of the s.s. *Asama* and *Gloucester City*, belonging to J. M. Wood. Esq., of Liverpool, and Messrs. W. R. Corfield & Co., of Cardiff, respectively.

The boilers of these steamers were covered in the usual way for two-thirds with ordinary cement, the lower third being unprotected. This latter portion of the boilers were clothed with the blue asbestos mattresses, cut and filled round and secured by flat iron bands about 1 foot apart. The tests were :—

s.s. *Asama.*

Boiler pressure	160 lbs.
Temperature of atmosphere	72 deg.
" on mattress	75 "
" between mattress and boiler ..	237 "

s.s. *Gloucester City.*

Boiler pressure	100 lbs.
Temperature of atmosphere	78 deg.
" on mattress	80 "
" between mattress and boiler ..	180 "

It is evident from these tests that the mattresses are perfect non conductors, and that any abnormal rise in the temperature affecting the tanks or hulls of vessels under the boilers may be entirely avoided, and the present exceptional deterioration stopped.

Beyond this specific application where cement cannot be applied, we do not think that any cement covering can equal the above result in the passage of heat, and the removability at any time of the mattresses for inspection and their indestructibility, ought to make this mattress clothing a formidable rival to cement.

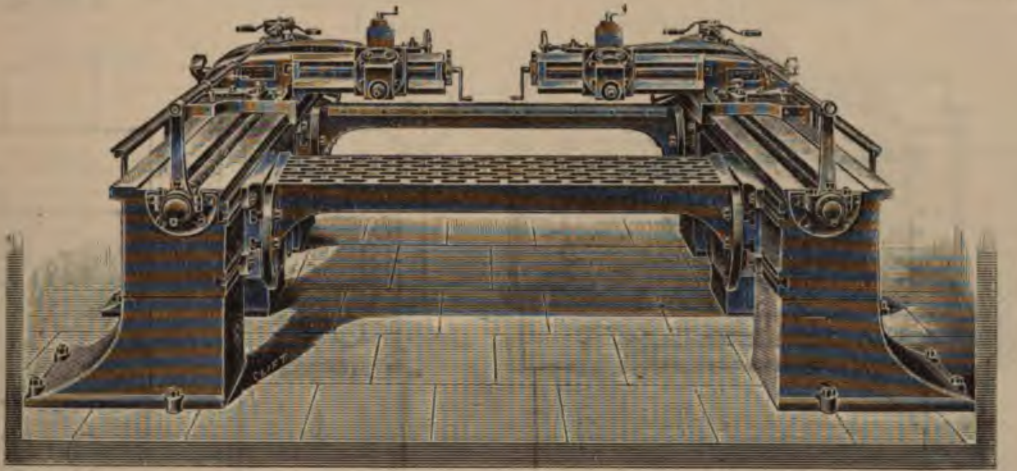
In the form of ropes also this asbestos forms a very effective and extremely light lagging when coiled around piping, and the question of weight is of considerable consequence in long lengths of unsupported piping. Joints also are always accessible, and lengths of piping can be removed and replaced without destruction of the clothing.

This asbestos wool has been found to card out into a splendid resilient, dry stuffing for bedding or pillows, and as it will harbour no insects, and is indestructible by fire, it ought to prove the very thing for bedding on board ship. It is said to be most healthy to sleep upon and cool in hot weather and warm in cold, it is fire-proof, rot-proof, insect and germ proof, and therefore undoubtedly healthy.

Such mattresses might be used very efficiently to smother a fire instead of lending an intensely pungent and suffocating smoke to a conflagration as ordinary hair or wool mattresses and pillows would do.

Blue asbestos millboard, whilst about 25 per cent. lighter than white millboard, possesses nearly twice the tensile strength and is therefore a splendid jointing material, especially for dry steam.

RICHARDS' "SCARFING" MACHINE.



WE have pleasure in presenting our readers with the above illustration of a very effective machine for "scarfing" plates, built and designed by Geo. Richards & Co., Limited, Broadheath, near Manchester, and recently supplied (through their Newcastle agents, Crosier, Stephens & Co.) to C. S. Swan & Hunter, Limited, of the Wallsend Shipyards. This machine which is the first of its type, is capable of doing about double the work of an ordinary "Scarfer," and with much greater facility. While a plate is being "scarfed" on both corners at one end of the machine, a second plate can be fixed ready for "scarfing" at the opposite end, and when the "scarfing" is completed on the first plate the arms can be run to the other ends of the beds and immediately deal with the second plate, so that the machine need not at any time be allowed to stand idle. The machine is capable of "scarfing" six shell plates in an hour, with two "scarfs" on each varying from 1½ in. to 5½ in. wide by 9 in. to 11 in. long. In less than two hours a large keel plate has been "scarfed" from side to side at one end, the "scarf" being 45 in. wide by 17 in. long, and being turned over had two additional "scarfs," each 11 in. by 17 in. made at the other end. We understand this would have been impossible on an ordinary machine, but on the machine under notice, there is practically no limit to the length of "scarf" that may be done. It may here be stated a second machine has been ordered by Messrs. Swan & Hunter, Limited.

WATER-TUBE BOILERS.*

By J. WATT, Esq., Associate.

SOME years ago the writer had the honour of reading a paper on the subject of water-tube boilers before the Liverpool Polytechnic Society, and, after enumerating the points which constituted a good water-tube boiler, deduced therefrom the following rules or laws, which should be observed in designing a trustworthy steam generator. They were as follows:—

(1) "The tubes should be arranged in a position to absorb the greatest amount of heat, by causing the flame to travel in an upward direction at right angles to their axis.

(2) "The tubes should be in a horizontal or inclined position, as the most efficient to emit heat.

(3) "The steam generated should have free and unobstructed escape to the steam receiver.

(4) "The circulation or supply of water to the tubes must be copious to prevent overheating.

"These are the theoretical, and form the essential, conditions of an efficient water-tube steam boiler.

"But, in addition to these, there is another, not the less important, which concerns the practical part or life of a boiler, viz., the facilities for inspection, cleaning and repairing."

It is twenty-two years since the above was written, and, although old, it is quite as applicable to-day as then; and, as far as the writer's experience goes, quite borne out by practice.

FIG. 1.

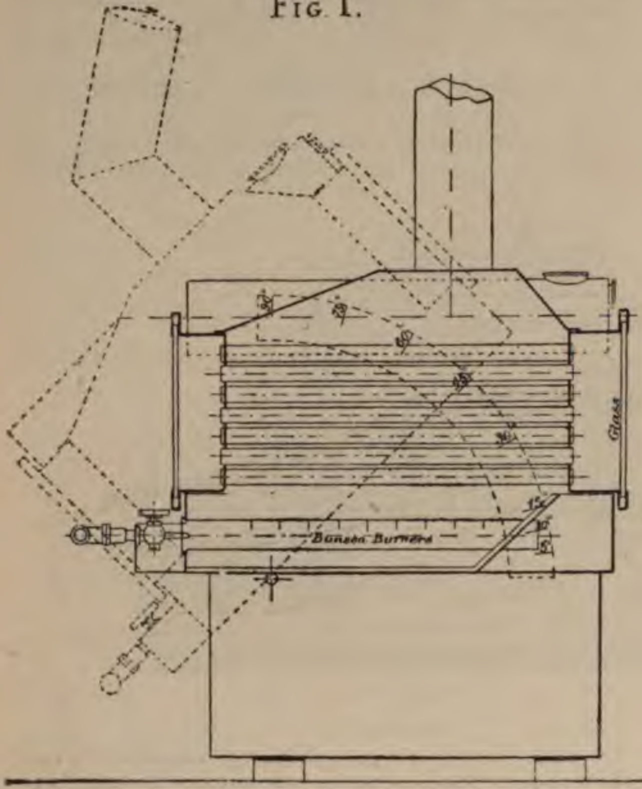


FIG 2

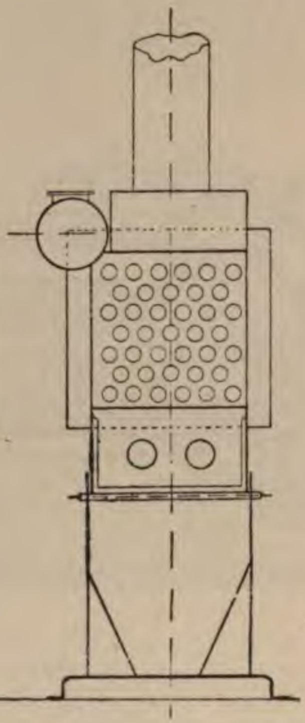
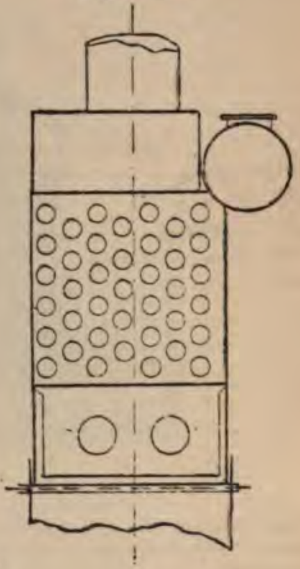


FIG. 2 A



There is, perhaps, no water-tube boiler made that will fully come up to all the requirements here laid down, but the nearer we can approach this standard, the more perfect and successful will be the boiler; and by applying this standard to any existing boiler, we are enabled to point out, not only its merits but also its defects.

It is not the writer's intention of going over the whole range of this subject of water-tube boilers, but to lay before you the result of a few experiments, which may elucidate and explain some of the many mysterious circumstances connected with this complex subject.

A water-tube boiler may be defined simply as an assemblage of tubes filled with water and placed over a fire. The ends of the tubes are fixed to two receivers, which combine the whole together. If the receivers be cylindrical where the tubes fit, then the tubes are more or less bent to suit; if flat, the tubes are generally straight. The advocates of bent tubes claim the bending as important in taking up or accommodating themselves to the expansion of the boiler when under steam. On the other hand, those who advocate the straight tubes find no difficulty arising from this point. Straight tubes offer the best advantages in respect of inspection, cleaning, and renewals.

The experiments were made with a small model boiler (see figs. 1 and 2) containing thirty-nine straight tubes, each ⅜ in. diameter by 9 in. long, containing 2·9 square feet of heating surface. The receivers to which the tubes were attached were flat, the end plates were of glass, so that the tubes could be seen right through, and the action going on inside could be distinctly observed. A steam receiver was also placed on the top, connecting the other two receivers. Heat was supplied by two Bunsen burners, consisting of two tubes with cross slots, the heating taking place being very much similar to that of an ordinary firegrate furnace. The model was so constructed that it could be used or tried in a great number of different positions.

The object of the first series of experiments was made with a view of finding out the relative value of heating surface when the tubes were angled from a horizontal position gradually to that of a vertical one, or through an angle of 90 deg. The experiments were conducted at atmospheric pressure, and commenced by first raising a given weight of water to the boiling point, and then ascertaining the amount evaporated after an interval of fifteen minutes.

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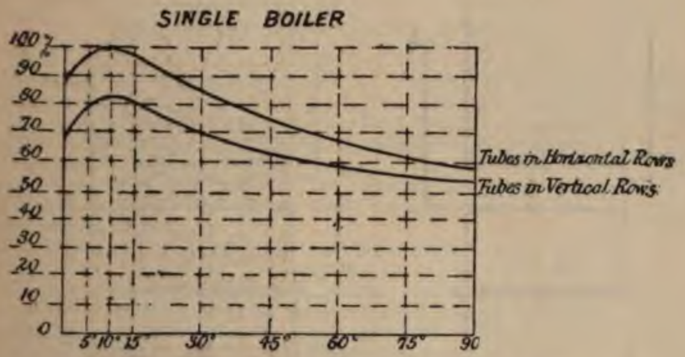
* Read at the Thirty-seventh Session of the Institution of Naval Architects, March 26th, 1896; the Right Hon. the Earl of Hopetoun, G.C.M.G., President, in the chair.

After a few preliminary trials it was found that when the boiler was angled about 10 deg. from the horizontal the evaporation was highest, viz., 8½ oz.; when the angle was increased to 15 deg. the evaporation was 8¼ oz.; 30 deg., 7½ oz.; 45 deg., 6½ oz.; 60 deg., 5¾ oz.; 75 deg., 5½ oz.; and 90 deg., 5 oz. Again, on reducing the angle to 5 deg., the evaporation was 8¼ oz., and when level 7½ oz. It may be here stated that, owing to the pressure of gas varying a little, very seldom the same results could exactly be arrived at; but by making several trials the above is a fair average. This is graphically represented in fig. 3 (top curve). the vertical ordinates representing the percentage of evaporation at the various angles at which the boiler was tried, beginning at the horizontal position and gradually rising to the vertical position. It was found when the boiler was angled 10 deg., it gave the best result: therefore 10 deg. represents the maximum evaporation, or 100 per cent.

In looking at this diagram, we find that in any water-tube boiler whose tubes are inclined, say, 10 deg., by merely increasing the angle to 30 deg., the amount of water evaporated is reduced from 100 to 85, or 15 per cent. less. If the angle be increased to 60 deg., the decrease will be 33 per cent. And at 90 deg., or the tubes vertical, the reduction is a little over 40 per cent. This compares very favourably with the old fashioned rule employed in the ordinary steam boiler, of allowing two square feet of vertical heating surface to be of equal value to each one of horizontal.

FIG 3



These experiments were conducted with the tubes placed in horizontal rows, so as to allow the products of combustion to travel in a zig-zag direction to the funnel. The next series were taken with the boiler turned on its side, so as to form the tubes into vertical rows, and giving the products of combustion a more direct course to the funnel (see fig. 2A). The result is shown by the lower curve on fig 3. The highest percentage was 82 per cent. at 10 deg., and 53 per cent. at 90 deg., the best result showing a difference of 18 per cent. in favour of the former arrangement of tubes.

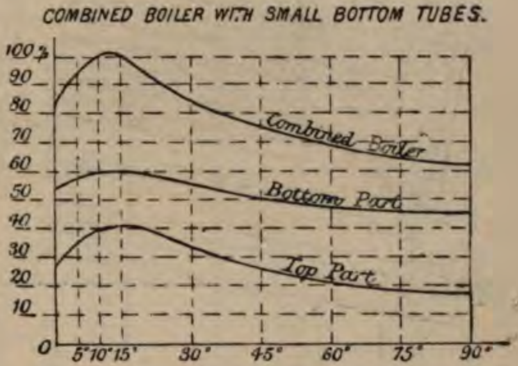
Instructive as these tests may be, the next series will show still more striking results. In order to arrive at the duty performed by various tubes or rows of tubes, and more especially those nearest to the source of heat. If we take another boiler — or, rather, a part of a boiler representing that row of tubes which is nearest to the fire —and place the two together, as represented in fig. 4, we have the means of arriving at the evaporation of each boiler separately. This small boiler consists of six tubes only, having a heating surface of ·44 square feet, compared with the larger one of 2·9 square feet, or a combined H.S. of 3·34 square feet.

The results of this arrangement are represented on diagram fig. 5. The upper curve shows the combined evaporation of both boilers, and, although there is an augmented H.S. of about 15 per cent., yet there is very little difference in the amount evaporated. The lower curve shows the evaporation of the original or larger boiler, and we now see that at its best it is reduced from 100 per cent. to 40 per cent. at 10 deg., and from 60 per cent. to 17 per cent. at 90 deg. On the other hand, the small boiler is represented by the middle curve, and its evaporation at its best is 60 per cent. at 10 deg., and 45 per cent. at 90 deg. The above results may be stated in other words, viz.:—That practically 60 per cent. of all the steam generated in any water-tube boiler with tubes at any angle is generated in the first or nearest row of tubes to the fire. The remaining 40 per cent. is left for the larger portion of the boiler to accomplish.

By reversing the positions of the two boilers—by placing the smaller on the top of the larger one—we can arrive at the evaporation of the top row; but this was found to be so small as not to be taken notice of. The writer had not the means of testing the intermediate rows; but the following table will not be very far off:—

1st	row nearest fire	evaporated	60·0	p.c. of total	evaporation.
2nd	,,	,,	24·0	,,	,,
3rd	,,	,,	9·5	,,	,,
4th	,,	,,	3·5	,,	,
5th	,,	,,	1·5	,,	,,
6th	,,	,,	1·0	,,	,,
7th	,,	,,	0·5	,,	,,
			100·0		

FIG. 5.



The importance of the above cannot be overlooked. Either the first row is doing too much or the back row too little; and the conclusion arrived at is that, practically, the first row is receiving the whole wear and tear of the boiler, therefore, more liable to damage and renewals. This has proved itself in the case of copper tubes, which, although a better conductor of heat than either iron or steel, yet were unable to stand the severe work they had to perform. The danger from overheating and rupture is not only very unpleasant from a stokehole point of view, but the giving way at some critical moment, demands our most important consideration; in short, it is the vital part of the water-tube boiler.

Seeing this difficulty some time ago, the writer devised some means by which the first row was relieved of this heavy duty, and more laid on those immediately behind. This is accomplished by substituting tubes of much larger diameter nearest to the fire than those which are more remote. The larger tubes contain more water, and present less heating surface for the space occupied than those of small diameter. The result is that the evaporation is less with the larger tubes but greater with the smaller. Fig. 6 represents the arrangement. For the six ⅜ in. tubes we now adopt three ¾ in. tubes in their place. The weight of water in the three tubes is double that in the six smaller ones, while the heating surface remains the same. The diagram representing the results of the trials is shown on fig. 7. The top curve, as before, representing the results of the two boilers. Practically there is very little difference compared with the similar top curves of figs. 3 and

5; if anything, it is slightly in favour of fig. 7. But when we come to compare the two lower curves with the similar curves in fig. 5, we find that they have almost changed places. Taking the top or larger boiler, the evaporation at 10 deg. is nearly 60 per cent. of the total as compared with a little over 40 per cent. shown on the former trial. The curve dropping down at 90 deg. to 27 per cent. against 17 per cent. Taking the lower boiler, representing the three large tubes, the evaporation is reduced from 60 per cent. to a little over 40 per cent. at 10 deg. with the larger tubes, terminating at 38 per cent. at 90 deg. It will be observed that the two curves cross each other when the boiler is at an angle of about 55 deg. showing that the evaporation angle is about equal in each boiler. From this point on to 90 deg. the smaller boiler evaporates more than the larger; but, as the angle decreases below 55 deg., the larger boiler evaporates more than the smaller. We here see that the evaporation in the first row of tubes is very much reduced, there is less liability to overheating, and accidents are reduced to a minimum.

The quantity of water evaporated by the first row of small tubes was at the rate of 5 lbs. per square foot of H.S. per hour, and the velocity at the end of the tubes about 3·8 ft. per second. The tubes were full of semi-steam and water, so that no light could be seen at the other end; evidently these tubes were evaporating their maximum quantity with efficiency.

On the other hand, with the row of large bottom tubes, the rate of evaporation was about 3·5 lbs. per square foot H.S., and the velocity at the tube ends (steam only) about 2·9 ft. per second. Up to an angle of about 60 deg. a light could be distinctly seen through these tubes, the steam occupying about one-third of the area on the top side, the water underneath presenting a clear solid mass. Above 60 deg. elevation the water and steam became more or less mixed up, so that a light could not be seen at the other end. From the apparently easy manner in which these tubes were doing their work, it was evident the maximum amount of evaporation had not been reached. There was a large reserve of solid water in the tube, and the steam appeared to pass freely away without taking any water along with it. Indeed, there could not be a strong water current, for on blocking up the bottom end of one tube to the extent of reducing its area to one-fourth, there appeared to be no different result.

FIG. 4.

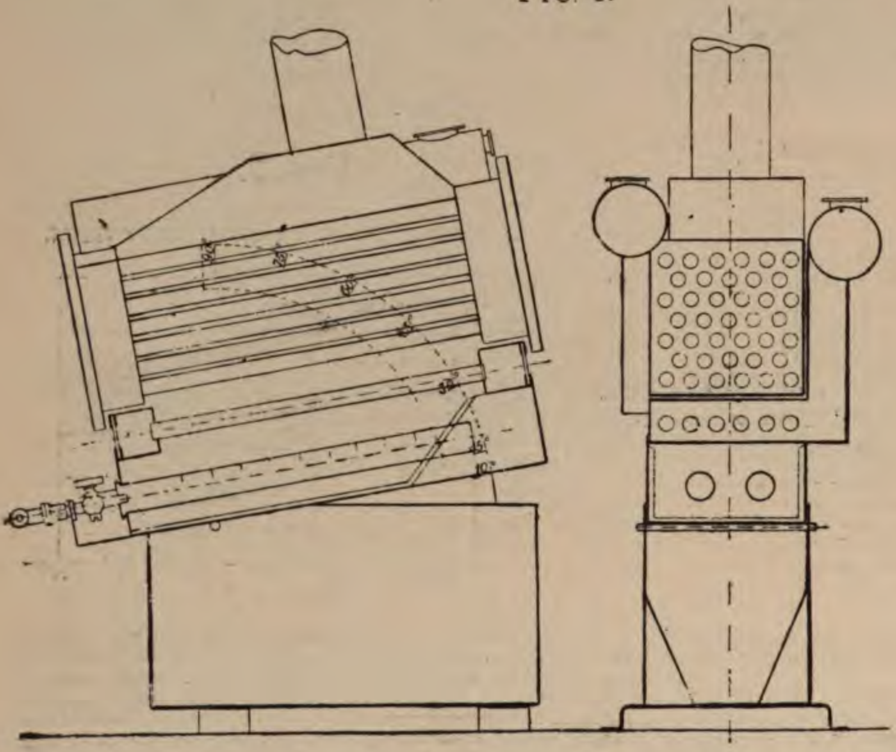
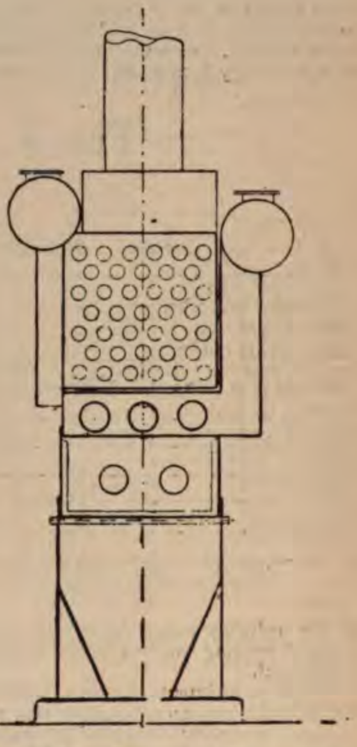


FIG 6



It must be remembered that the above trials were made at a pressure of one atmosphere where the relative volumes of steam and water are as 1,640 to 1. For higher pressures a corresponding rate of combustion may be adopted.

The most vital parts in any water-tube boiler, and the most easily damaged by overheating, are those tubes in close proximity to the fire. To overcome this difficulty two courses are open—(*a*) by adopting small tubes and providing for a vigorous circulation; (*b*) by adopting larger tubes and a less active circulation. Adopting the former, there is a limit both in respect to the speed of the current and the quantity of steam in contact with the heating surfaces. According to Mr. Thornycroft's experiments, at a pressure of three atmospheres, the relative volume of steam and water passing through a number of 1⅛ in. tubes was about 5·4 to 1, and at 12 atmospheres this would equal 1½ to 1, or three volumes of steam, at an average, in each tube, to two of water. A condition of things which presents to us two evils. One is the danger arising from the tube becoming much hotter than the temperature due to the pressure. As an instance of this, there is the failure of copper tubes in water-tube boilers to stand this excessive heat. The second evil is the slow corrosion taking place, owing to part of the steam in contact with the tube becoming decomposed at a high temperature, forming oxide of iron and hydrogen gas. Some years ago apparatuses for superheating steam were placed in uptakes; but even at this low temperature their life was three or four years at the most.

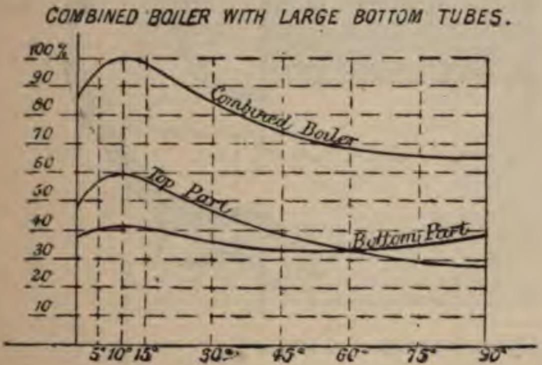
By the improved arrangement of larger tubes to face the first and direct action of the fire, a larger body of more solid water is in actual contact with the heating surfaces. The liability to damage by over-heating is reduced to a minimum; the duty of the various tubes more evenly distributed, and the steam generated more freely disengaged.

In conclusion, there is one point which, during the time these experiments were being made, confirmed the writer's views more strongly of a grave defect in Belleville water-tube boilers for marine purposes, and, as this boiler is now being freely adopted by our Admiralty, his humble protest must be taken from a taxpayer's point of view.

Those who are responsible for the position and arrangement of this boiler on board of a sea-going vessel have evidently not given the subject of an unsteady platform any consideration. Numerous tubes have given way at sea; not that it is the only boiler which suffers from defective tubes; but in all probability these same tubes would not have given way had the boilers not been tossed about in a sea way. In many instances these tubes have been replaced by thicker ones, and in some cases by Serve tubes, with little better results. Still the true cause of their failure is not discovered, therefore no effectual remedy applied, and thus the error is repeated.

The arrangement of all water-tube boilers, with horizontal or slightly-inclined tubes on board ship, should be parallel with the line of keel. But it appears to be the rule, so far as this boiler in question is concerned, to place the same across the ship. Now, the inclination or angle of the Belleville boiler tubes is about 2 deg. or 3 deg. from the horizontal, and as 10 deg., say, is not an uncommon angle for a ship to roll at sea, it follows that the tubes will become depressed or angle reversed to the extent of 7 deg. or 8 deg.

FIG. 7.



A ship to roll from eight to ten rolls per minute is not uncommon, and therefore six or eight seconds would be the duration of one roll.

Now, imagine the ship rolling, a heavy fire on the grate, and in this time these lower tubes, generating, as we have seen, such a large volume of steam, which would immediately reverse the circulating current, fill the upper ends and be here imprisoned, only to be relieved by the next roll. The greater portion of the steam will now be transferred to the other end, to be again re-imprisoned, and so on till the ship gets into less turbulent waters.

With reference to what the continued effect on these semi-dry tubes would be in a sea-way, or in the event of the ship having a list, the result is left for your better and impartial judgment.

ALUMINIUM.

WE have received a small book on Aluminium, its manufacture and its uses, from the Aluminium Supply Co., of 38, Victoria Buildings, Manchester, who are the European agents of the Pittsburgh Reduction Co. This latter corporation has attracted some amount of notice lately owing to the fact of its being one of the first to establish works in the vicinity of the Niagara Falls, and obtains its power from the Power Works recently established there. The book commences with a short general treatise on the metal, and follows on with its composition and the forms in which it is supplied to the market. The features of corrodibility, impurities in the metal, hardness and elasticity, specific gravity, strength, solubility, electro-chemical properties, melting point, specific heat, latent heat of fusion, thermal conductivity, electrical properties, and linear expansion under varying temperatures are dealt with then in detail. Most of these particulars are set forth in comparative tables, comprising other materials. A short and concise description is then given on the melting, casting, annealing, rolling, polishing, scratch brushing, dipping, frosting, burnishing, welding, soldering, and electro-plating of aluminium. A few of the uses to which the metal is put are set forth, the description being illustrated by a plate, showing a variety of articles. A considerable portion of the book is occupied in the matter of aluminium alloys, specific particulars as to mixtures, &c., being given in each particular case. The remainder of the book consists of a variety of useful tables and formulæ such as are useful to engineers and others. Taken altogether, the book is a useful and interesting publication, but it must be borne in mind that as it is published by manufacturers of the material, too much prominence is not given to the disadvantages and difficulties of working the metal.

WATSON'S PATENT BOILER TUBE STOPPERS.

MESSRS. HENRY WALLWORK & CO., Union Bridge Ironworks, Manchester, are introducing an appliance for stopping leaking or burst tubes in marine and locomotive boilers, which will be much appreciated now that multitubular boilers are becoming so general for steamship purposes. This device, which is called Watson's patent boiler tube stopper, is shown in illustration (Fig. 1) from which its general form will be readily understood. The remaining illustrations indicate its method of application, which may be described as follows:—Immediately a tube is burst, or found to be leaky, one of these stoppers is pushed from the front end into the tube affected, at the burst part, as shown in Fig. 2. A box spanner is then fixed on the stopper, and held on the nut (Fig. 3) to drive the stopper into position. When this is done the front joint is held against the mouth of the tube, and screwed up, without removing the spanner (Fig. 4), this operation being readily performed in a minute's

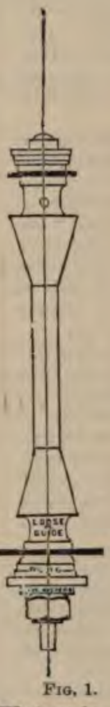


FIG. 1.

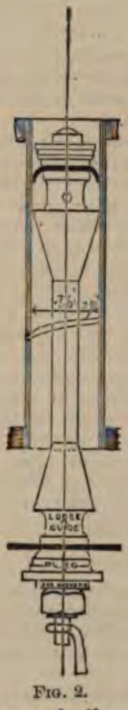


FIG. 2.

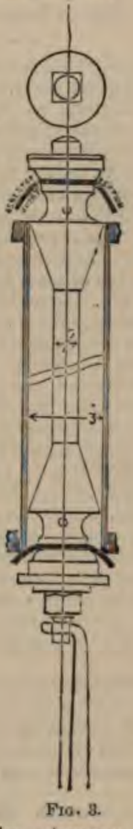


FIG. 3.

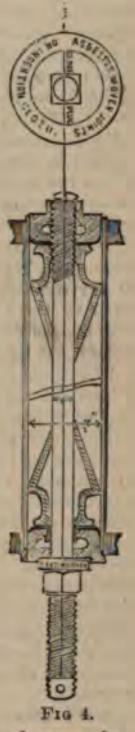


FIG. 4.

time. The rods can be linked if required, and the plugs are slightly tapered in the body and thread so that the back plug can be screwed out from the front end. If there is a want of sufficient heating surface in the boiler the rods can be supplied in the form of tubes, so as to remedy this deficiency. These stoppers have passed through a number of severe tests satisfactorily, and a special feature is the absence of any risk to the operator, as a long spanner can be used for applying the stopper; and as they can also be applied without drawing the fires or letting down steam pressure they will be found very serviceable and handy to carry on board steamships, thus saving a great deal of the inconvenience and loss of time frequently caused when a tube is burst. They have already been adopted by several large steamship, ferry, canal and railway companies.

COMPOUND MARINE BOILERS.*

By COLONEL N. SOLIANI, Director of Naval Construction, Italian Navy; Member.

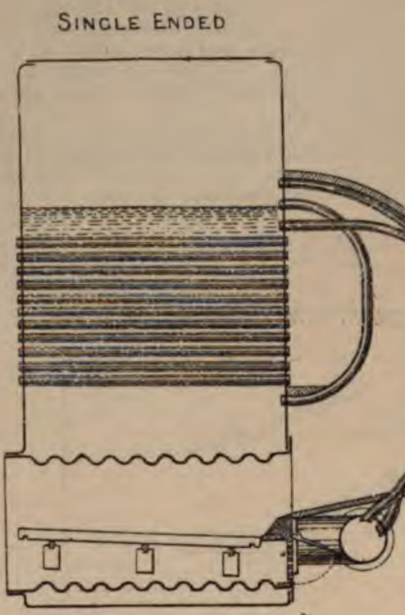
THE steady advance of water-tube boilers in the field of steam navigation has aroused a natural reaction in favour of ordinary marine cylindrical boilers, which, according to many, although inferior in certain respects, possess features of great value for marine purposes, not yet fully secured in the new boilers. This view refers, however, to boilers for ships other than torpedo craft, which have requirements that only water-tube boilers can now fulfil. Within these limits the contention in favour of cylindrical boilers does not appear groundless.

In fact, the marine cylindrical boiler is not a new production of the inventive genius of man, but is the result of experience of two generations at sea. It is the last stage reached of development and improvement, under existing practical conditions, of an "organ" in the evolution of the entire "organism," "the steamship," to which it belongs. And, in such a long adaptation to surrounding conditions, the marine boiler, from the early types to the present one, has, in effect, developed features of real fitness for ocean navigation, and reached a state of perfection not easy to attain immediately with any new boiler.

The prominent features of the modern marine cylindrical boilers are well known, viz., efficiency, simplicity of parts, fewness of bolted joints, durability, easiness of inside inspection, fitness to available space on board ships, small liability to derangement, possible concentration of large power in few boilers, so reducing number and complication of pipes and fittings, steadiness of action by which water feed and steam pressure are under easy control, facility of repair of the heating tubes under steam, adaptability for temporary use of sea water for supplementary feed, &c.

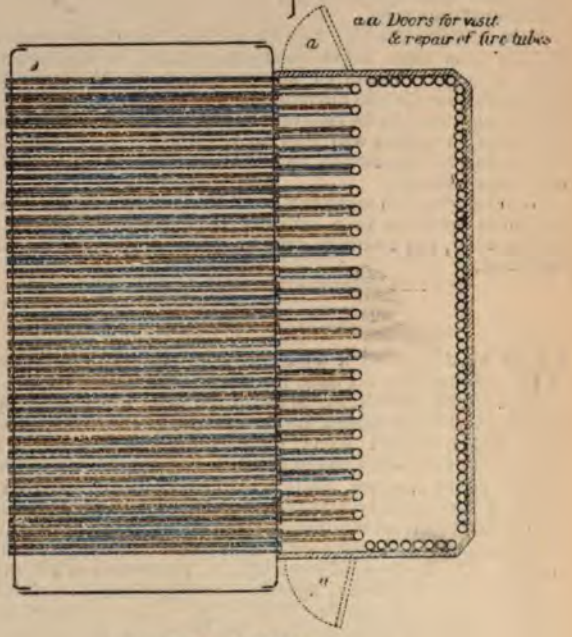
Although some of the foregoing characteristics may be claimed also for water-tube boilers of various types, others of them are certainly special to the cylindrical boiler, and it is to these important features that cylindrical boilers owe their success in the domain of ocean navigation and the present campaign in their favour.

In this respect it is worth notice that, if we except France, where water-tube boilers of the Belleville and a few other types are in general use, both for merchant and war ships, in England and other countries the Mercantile Marine has not yet shown any marked propensity to abandon its familiar and faithful servant; while the Navies, although now in full swing for the new boilers, began really to feel the want of a change, only when the cylindrical boilers "appeared" unsuitable to forced draught. I use on purpose the word "appeared," because I think it is not yet proved whether the proclaimed unsuitableness is unavoidably due to organic constitution of the boilers, or to the magnitude of the extra strain and suddenness with which it was applied before the boilers were given time to adapt themselves to the new demands made upon them.



LONGITUDINAL VERTICAL SECTION

FIG. 1.



HORIZONTAL SECTION

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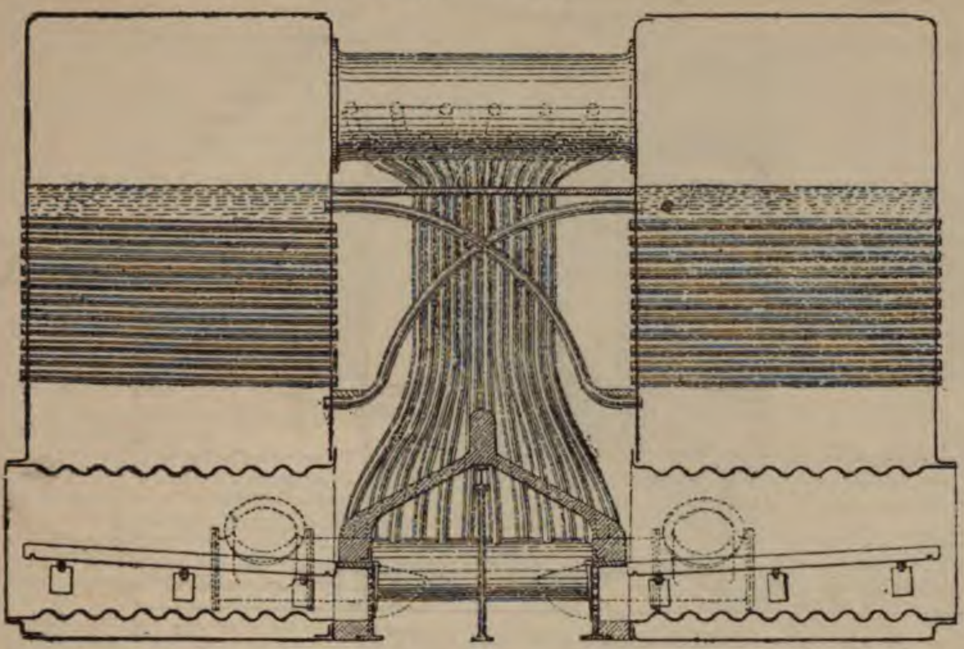
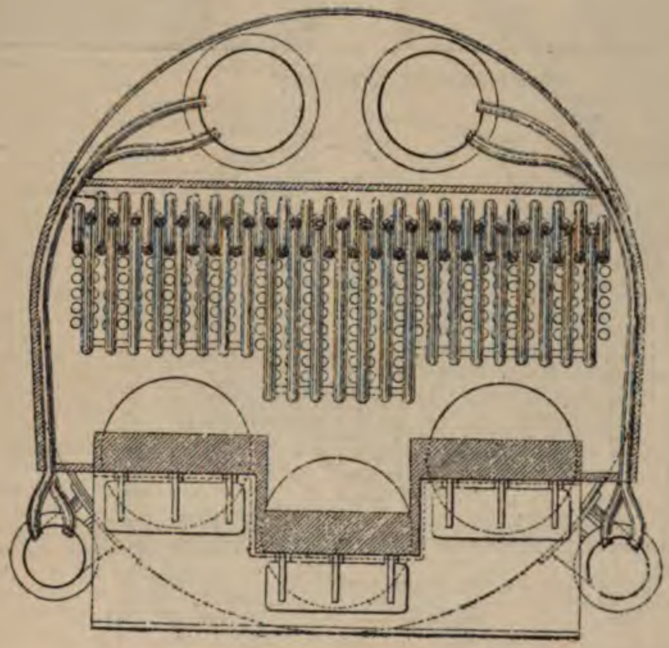
* Read at the Thirty-seventh Session of the Institute of Naval Architects, March 26th, 1896; the Right Hon. the Earl of Hopetoun, G.C.M.G., President, in the chair.



DOUBLE ENDED

LONGITUDINAL VERTICAL SECTION

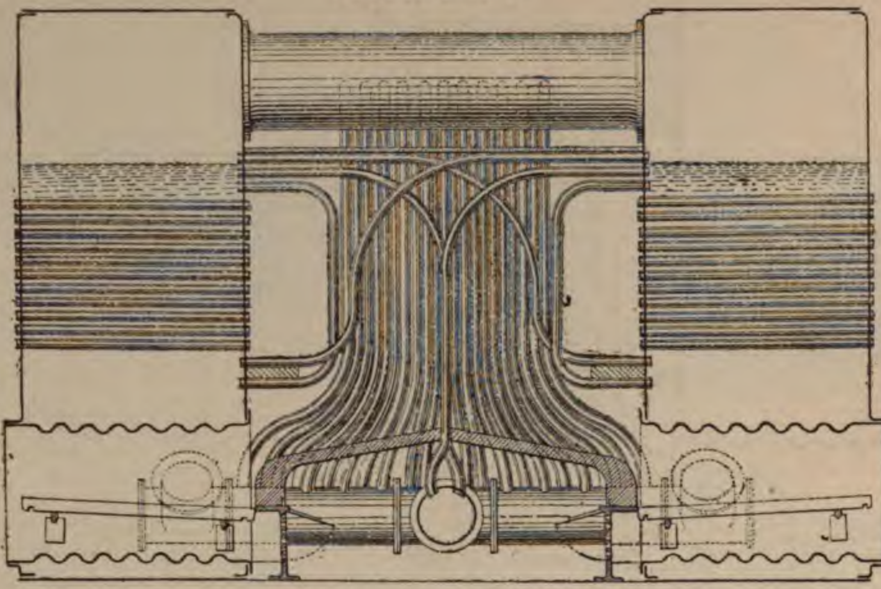
FIG. 2.



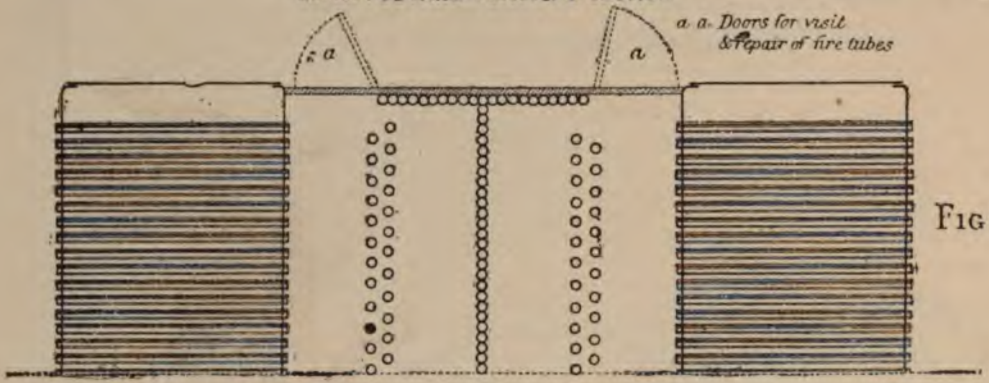
TRANSVERSE VERTICAL SECTION.

WITH COMBUSTION CHAMBER BUILT UP WITH WATER TUBES

DOUBLE ENDED

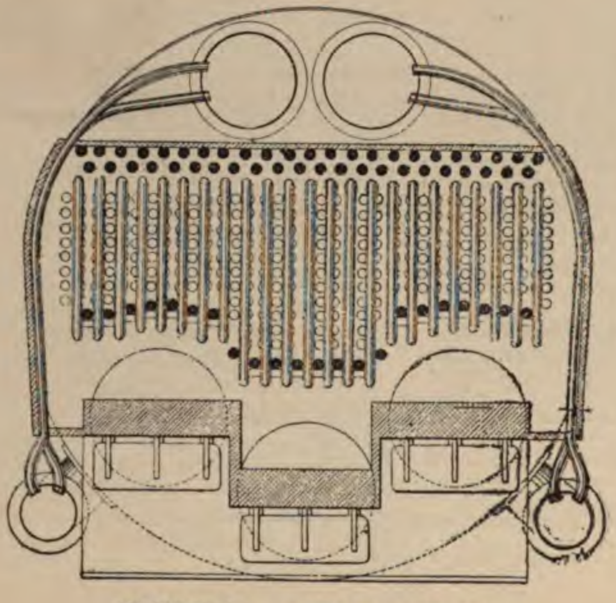


LONGITUDINAL VERTICAL SECTION


a
a
a. a. Doors for visit & repair of fire tubes

HORIZONTAL SECTION

FIG. 3.



TRANSVERSE VERTICAL SECTION

In support of this view, the very good results obtained with the Serve tubes, and with the Howden and Brown systems of combustion, by which the steaming power of marine cylindrical boilers, put unit area of wetted heating surface, has been brought up to the limits which were lately deemed dangerous, might be mentioned; but, apart from these arrangements, which, if efficient in increasing the specific power of the boilers, have certainly not improved them in respect of lightness and suitableness to rapid steaming—which are prominent features of the water-tube boilers—it may be asked: Have cylindrical boilers reached their last stage of development? Cannot such boilers compete much longer, or must they soon give way to the new-comers?

Well, while it is pretty certain that, owing to certain important advantages which water-tube boilers offer, principally for Navy purposes, the difficulties which still beset their general adoption will be vigorously attacked and finally overcome, I think, from what has been said above, that cylindrical boilers not only have, as yet, a great power of endurance in the mercantile competition, but that there is still room on their side for further improvement, by which their vitality may be increased and the struggle prolonged, even for Navy purposes, with advantage to the great interests involved.

This new vitality may, I think, be conferred on cylindrical boilers by "compounding" them with water tubes in such a way as to make them partake, to a certain extent, of the good features of the water-tube boilers, without detracting much from their own valuable characteristics.

There are already in the market various compound boilers, viz., boilers having the heating surface made up both of water and fire tubes.

Such are the Roger's boiler, the Barthlet's boiler, the Anderson and Lyall's boiler, &c.; but none of them, as far as I know, may be styled "a real compound marine cylindrical boiler." Even the Anderson and Lyall's boiler, although more akin to it, is altogether a different thing; it is a special boiler of itself, having features which belong to various types, resembling a locomotive boiler in its furnace, a marine boiler in its combustion chamber, and a stationary boiler in its barrel.

In saying so I do not wish to disparage these boilers which, on the contrary, appear very good and efficient, but simply to show that they are not the kind of boiler I mean, viz., a marine cylindrical boiler compounded with water tubes to the extent that is necessary to give protection to the tubes and tube plates and improve the boiler also in other respects (such as economy of weight, fitness to rapid changes of temperature, &c.), but without altering its main characters.

Such a result may, in my opinion, be achieved simply by doing away altogether with the water spaces around the ordinary combustion chambers and substituting for them water tubes, some of which would be properly arranged as a protecting screen in front of the tubes and tube plates.

My meaning will perhaps be clearer by reference to figs. 1 and 2, in which the proposed alteration is sketched as applied both to single and double ended cylindrical boilers.

Such boilers, if successful, would be lighter, simpler, less sensitive to difference of temperature and to rapid changes of fire; while the screen of water tubes in front of the tube plates would in them, as in the Anderson and Lyall boiler, protect to a great extent plates and tubes from damage under forced draught.

In other words, these boilers would fulfil most of the requirements of modern steaming at sea, and exert, if adopted, a useful function in the present period of transition, which, by them, would become longer and smoother.

The benefit would be mainly felt by the Mercantile Marine, on account of the larger interests involved, and because of its requirements to which the ordinary marine boilers appear on the whole so well suited.

Another advantage of the arrangement I propose would be the facility of admitting air under the back end of the fire-grate, in a proper measure, to improve the efficiency of combustion, through a regulating door fitted under the bridge and underneath the casing of water tubes forming the combustion chambers.

In marine engineering I am only a *dilettante*, therefore in what I have had the honour to say, my aim has been simply to raise a question which seems important and to merit discussion by the experienced members of the Institution. My suggestions may be briefly summarised as follows, with a view to meet discussion:—

(1) For swift vessels, of small dimensions, designed for the use of torpedoes or special services, water-tube boilers are a necessity.

(2) For certain classes of warships of larger size, water-tube boilers are distinctly advantageous.

(3) For mercantile purposes and many classes of warships, the water-tube boilers are not yet perfectly suitable, and the cylindrical type of marine boiler is still to be preferred and its continued employment is probable for some considerable time.

(4) There is a possibility of retaining the most valuable characteristics of the cylindrical type, while securing increased efficiency and fitness to meet the exigencies of modern steaming, by means of arrangements of water tubes somewhat of the character illustrated by figs. 1, 2, and 3.

STEAM SIRENS.

THE signalling between ships and the shore, and between each other at sea has been much facilitated in recent years by the use of the steam siren, due mainly to two very important features in the apparatus, viz., great sound-penetrative effect in the atmosphere, thus covering a great distance, and the extreme ease by which the device can be manipulated to produce various modulations or notes, thus enabling the operator to quickly give a variety of signals by a particular sequence or class of notes.

The type of siren by which this effect can be produced is that in which the note-producing device is a small steam turbine. The moving, or active element is in the nature of rotating surfaces upon which the steam impresses a force by reaction against fixed surfaces with apertures arranged at some particular position, so as to produce the rotations of the active element. The note produced depends upon the vibration set up by the passage of the rotating element over the apertures, a high speed of the rotating part causing a high rate of vibration, and consequently a high note, and obviously any lowering of the speed of the device produces a lower note.

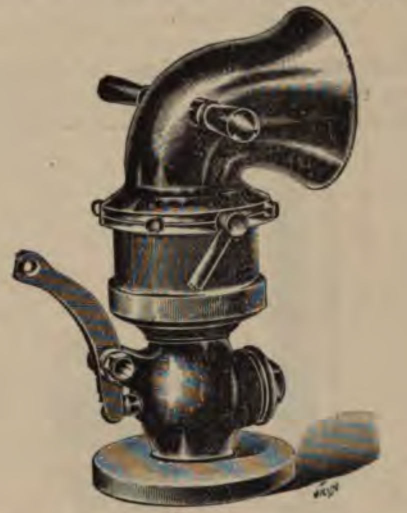


Fig. 1.

We have pleasure in illustrating, in the adjoining diagrams, three types of sirens which have been manufactured and brought out by Messrs. Sydney Smith & Sons, of Basford Brass Works, Nottingham. Fig. 1 shows a siren with a movable cowl; Fig. 2

shows a siren fitted with a movable cowl and combined with a harmony whistle, and Fig. 3 shows a similar device, but having the cowl fitted with gearing to allow of its operation from a distance. The mechanism of these sirens is extremely simple: it consists of a winged propeller, which is mounted upon a vertical shaft adapted to revolve with a minimum of friction. This propeller revolves on the top of a cup-shaped vessel against a circular plate, forming the top of the chamber or vessel. This plate has a number of radiating slots cut therein. When the steam or compressed air is admitted to the chamber it passes through these slots and impinges in a diagonal stream upon the ribs of the propeller, causing it to rotate according to the velocity of the flow of steam, and producing a number of vibrations resulting in sound, which is given out of the trumpet in powerful concentrated blasts, and is carried to a great distance, as our readers are no doubt well aware of.

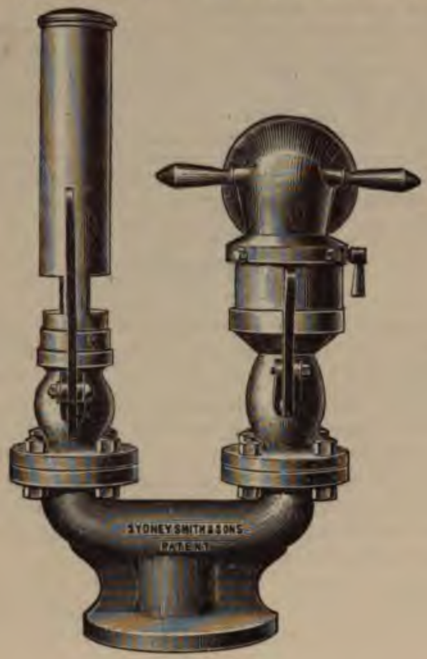


Fig. 2.

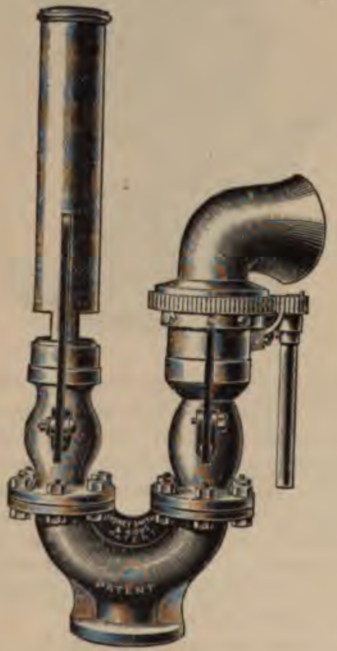


Fig. 3.

It is interesting to note that the late Mr. Sydney Smith, the founder, we believe, of the firm before mentioned, was a man to whom the world is much indebted for many ingenious and useful inventions. For example, he was the inventor of the first steam pressure gauge, and it is said that George Stephenson, who was the first person to try the invention, stated in a letter referring to the subject, "I feel it a duty I owe to the inventor as well as the public, to make it as universally known as possible." Mr. Smith's inventions, mentioned in an obituary notice in the *Times*, 1882, included a rotary steam engine, a rotary stocking frame, a spring safety valve for regulating the pressure of steam in boilers, a self-acting damper regulator for engines' furnaces, and a portable gas apparatus, for use in public and domestic institutions, the principle of which has been successfully applied in the lighting of railway stations. It also stated that Mr. Smith was one of the first engineers to construct barges made of forged plates for canal traffic.

We cannot close this notice without referring to the fact of the successors of the late Mr. Sydney Smith having followed closely in his footsteps by the study of many interesting subjects, and the production of apparatus connected therewith. One of the subjects that has long engaged their attention has been that of sound signalling, and considerable success has crowned their efforts, as is shown by the well-known devices for signalling, viz., "The Harmony," "Octave," and "Treble Toned," sound signal whistle.

INSTITUTION OF NAVAL ARCHITECTS.

THE Thirty-seventh Session of the Institution of Naval Architects was inaugurated by the formal meeting of the council in the Library of the Society of Arts, at 11 a.m. on Wednesday, March 25th, and continued on the two following days.

During the three days of the session, the following papers were read and discussed:—

On Wednesday, "Water-tight Doors, and their Danger to modern Fighting Ships," by Captain the Right Honourable Lord Charles Beresford, R.N.; "Watertight Doors," by Colonel N. Soliani, and "Some Geometry in connection with the Stability of Ships." On Thursday, "The Causes of mysterious Fractures in the Steel used by Marine Engineers as revealed by the Microscope," by A. E. Seaton; "The Measurement of Feed and Circulating Water, etc., by chemical means," by C. E. Stromeyer; "Salvage Appliances," by Captain J. Bell; "Compound Marine Boilers," by Colonel N. Soliani; "Water-tube Boilers," by J. Watt; and "Circulation in Water-tube Boilers," by Professor W. H. Watkinson. On Friday, "The Non-uniform Rolling of Ships," by Professor R. E. Froude; "A new Theory of the Pitching Motion of Ships on Waves, and of the stresses produced by this motion," by Captain A. Kriloff, I.R.N.; and "Notes on the Carriage of Grain Cargoes," by Captain G H. Little."

The first meeting of the members, held in the hall of the society at 12 o'clock, was very fully attended, and amongst others present we noticed Sir Wm. White (who was made the recipient of most cordial and heartfelt congratulations on his recovery), the Earl of Ravensworth, Admiral Sir John Hay, Sir E. J. Reed, Sir Raylton Dixon, Mr. Martell, Mr. Sennett, Mr. A. E. Seaton, Admiral Colomb, Captain Fitzgerald, Admiral Freemantle, Admiral Boys, Admiral Bowden-Smith. Admiral Morant, Rear-Admiral Wilson, Professor Byles, and Mr. Milton.

The annual report of the council, read by the secretary, Mr. George Holmes, was as follows:—

ANNUAL REPORT OF COUNCIL, 1895-96.

The council report with satisfaction that the last year has been one of activity and prosperity. The finances of the Institution remain in a satisfactory condition, and the number of members continues to increase.

The summer of 1895 marked a new departure in the annals of the Institution. For the first time in its history a meeting was held outside the British Isles. As was announced at the last spring meetings, a most cordial invitation was received to visit Paris during the summer. The invitation was accepted, and the summer meetings of the Institution were held in the French capital on June 11th to 15th, with results which are not likely to be forgotten by those who took part in them. Nothing could exceed the warmth of the welcome, or the splendour of the reception accorded to our members, by the Government of the French Republic, by the Municipal Council of Paris, by the Chamber of Commerce, by the Reception Committee, as well as by the great scientific bodies, private individuals, and manufacturers. Everything that was possible to be done was done to render the visit agreeable and instructive. The Institution was entertained by the President of the French Republic, by the Minister of Marine, by the President of the Municipal Council of Paris, by the President of the Chamber of Commerce, by the Reception Committee, and by our honoured colleague, Monsieur Emile Bertin, who, in his capacity as Chairman of the Executive Committee of the Reception Committee, bore the principal burthen of the preparations for the meetings. The Reception Committee, which was under the honorary presidency of the Minister of Marine, Vice-Admiral Besnard, and under the active presidency of Admiral Charles Duperré, President of the Commission of Works at the French Admiralty, included many of the most eminent naval officers, men of science, manufacturers, merchants, shipowners, and yachtsmen of France, together with representatives of the University of Paris and of the leading technical and scientific institutions and all the French members of this Institution. Visits were arranged to the laboratory of Monsieur R. Pictet, to the manufactories of Messrs. Cail and of Messieurs Sautter & Harlé, to the Belleville Boiler Works, to the Niclausse Boiler Works, to the locks of the Basin of la Villette, to the Eiffel Tower, and to the drainage system of Paris. In addition, many of the most interesting scientific institutions and factories in the city and its neighbourhood were open to our members during their stay in Paris. The most grateful thanks of the Institution are due to the French Government, the Reception Committee, and all the Corporations, firms, and individuals above referred to, for their hospitality and goodwill, and for the successful efforts which they made for the instruction and entertainment of the members who attended the meetings. The thanks of the Institution are also due, in a very marked degree, to his Excellency the Marquis of Dufferin, K.P., who, as Her Majesty's Ambassador in Paris, did all that lay in his power to contribute to the success of the meetings.

The council have received a most cordial invitation from the President of the Chamber of Commerce of Hamburg, acting on behalf of a committee representing the Government of the city and all its most important corporations, to hold the next summer meetings of the Institution in that important port and its neighbourhood. Encouraged by the success of their first visit outside the British Isles, the council have gladly accepted this most hospitable invitation. They have every reason to know that the utmost efforts are being put forward to make the meetings agreeable and instructive, and they trust that they will be supported by the presence of a large number of the members in doing honour to those who have so kindly invited them. The meetings will be held in the month of June, and full particulars will be published at as early a date as possible.

At the close of the Paris meeting, Lord Brassey, to the great regret of the council, resigned the office of President of the Institution, as he was about to leave the country to take up the Governorship of Victoria. During the time that he was President, Lord Brassey did all in his power to further the interests of the Institution. His efforts in this direction were invariably attended with success, and his conduct of the Paris meeting was not only highly advantageous to the Institution, but was deeply appreciated by the French people. Acting under Bye-law 41, the council elected the Earl of Hopetoun, G.C.M.G., as President of the Institution till the close of the annual general meeting, and have now much pleasure in proposing him for election as President by the members. Lord Hopetoun preceded Lord Brassey in the Governorship of Victoria. He is Paymaster-General, and represents the Admiralty in the House of Lords in the present Government. Like his predecessor in the chair, he is well qualified, both by his experience and by the deep interest which he takes in naval matters, to preside over this Institution.

The council having been approached in reference to the representation of shipbuilders and marine engineers in the technical department of the Board of Trade, and believing that their co-operation in this movement would be in accordance with the best interests of the profession, have appointed Dr. Francis Elgar and Mr. Archibald Denny as their representatives to co-operate with the representatives of other institutions and bodies for the purpose of furthering the object aimed at.

The council deeply regret to announce the death of one of the vice-presidents, the late Dr. Peter Denny, and the resignation, through ill-health, of another vice-president, Sir James Ramsden. The Institution has also to deplore the death of one of its members of council, the late Sir Edward Harland, whose loss will be greatly felt by the whole profession. The death of Captain Le Clerc, Naval Attaché at the French Embassy, and one of our Associates, has caused much sorrow to his many friends in this Institution. His presence, both for his own sake, and as the Naval representative of a friendly Power, was always greatly appreciated at our meetings.

Following the reading of the above report, the election of the President, the Earl of Hopetoun, G.C.M.G., and the following officers and council was proceeded with:—To be members of council, Mr. Soper; to be vice-presidents, Mr. Dunn and Mr. Yarrow.

At the initial stage of the proceedings the Chairman announced that the council had been pleased to elect as an honorary associate member of the Institution, Mons. Emile Bertin, chairman of the executive committee of the Paris Reception Committee, who being present, acknowledged the honour in a few well-chosen and graceful words.

The following gentlemen having been duly elected as members of the Institution—F. Baxter, R. W. Booth, J. J. Bourne T. Bredsdorff, J. Bruhn, A. Caird, T. W. Collins, W. R. Cox, L. Denny, H. Hand, F. Jacobith, J. E Muir, A. Pierrard, A. G. Rainage, W. Reavell, M. Ritson, S. F. A. Schnack; H. Shand, J. Smith, J. C. Stuelcken, T. S. Warren, J. Weir, J. Williams, H. Clarke, C. M. B. Dyer, R. Haig, E A. J. Pearce, G. Simpson, T. Albrecht, E. S. Booth, A. J. Daniel, R. Williamson, R. H. B. Thomson, W. H. Carter, J. A. Drakenberg, T. Hesketh, J. F. Kitching, R. Monroe, Leopold Roper, R. Ropner, Junr., W. C. Wallace, G. E. E. Warder, P. Anselm, P. Duff, A. G. Fox, E. J. Milton, F. Lobnitz, B. J. Haynes, W. A. Young, E. R. Bate, G. W. Claussen, F. H. M. L. Schneider, C. De Grave Sells, F. Stephenson, H. Wilkinson, R. Bettini, J. B. Huddy, W. T. Hockaday, J. H. Narbeth, J. J. Woodward, J. D. Milton, and C. Buchanan, and twenty-one gentlemen having been elected as associate members, the Chairman proceeded with the reading of his address, which we have pleasure in herewith quoting *in extenso*.

ADDRESS BY THE PRESIDENT (THE RIGHT HON. THE EARL OF HOPETOUN, G.C.M.G.)

I am glad to be able to congratulate the Institution upon the eminently satisfactory nature of the report which has just been presented by the council. It is a prosperity report, I think, in every sense of the word, and the meeting has heard with pleasure, I feel sure, that during the past year there has been no falling off in either the activity or sound financial position of the society

The events of last June must be fresh in the minds of all those whom I am now addressing. The Institution will ever bear in grateful recollection the warm invitation extended to them to visit Paris. The hearty welcome accorded to those who were able to attend, and the untiring and successful efforts of our hosts to make the visit a pleasant and instructive one, has placed a heavy load of debt upon this Institution.

We are glad to welcome amongst us to-day some of those gentlemen to whom we owe so much, and they may rest assured that we, on our side, will strive to repay a portion of the debt due to them during their sojourn on this side of the water.

We must not forget, when thanking our hosts of last year, that we are about to incur fresh liabilities in another direction. The Institution has, as the report tells us, been invited to hold its meetings during the coming summer in that great centre of industry and commercial enterprise, the city of Hamburg. My own personal feeling is that we can best testify our appreciation of this hospitable compliment by attending in as large numbers as possible, and I am absolutely certain that we may look forward to a most enjoyable visit over the water.

I pass now to the concluding paragraph of the report, which must of necessity tinge the whole document with a certain tone of sadness. The removal from our ranks by death of Mr. Peter Denny and Sir Edward Harland must be a serious loss to the Institution. They were gentlemen in the front rank of their profession. Their expert knowledge and experience were of the utmost value to those associated with them in this society, and their loss causes a serious void amongst those who are left. We feel, too, very keenly, the loss by death of Captain Le Clerc, the late Naval A.D.C. at the French Embassy. He was deservedly popular with all who knew him, and was nowhere more deeply appreciated than by his brother members in this Institution.

I cannot, gentlemen, turn from the subjects contained in the report, without some reference to the severe loss which the Institution has sustained through the removal to another sphere of usefulness of the late President, Lord Brassey. It would not be possible, on an occasion such as this, to do justice to the services which he has rendered to the Royal and Mercantile Navies of this country. An expert himself in all save the most technical details of the marine profession, he has done more than any other man to make our Navy and the necessity for a Navy familiar to the public. Before he commenced the publication of his Annual it was well-nigh impossible for the ordinary individual to obtain any continuity of information upon this subject. Lord Brassey has placed this information within the reach of everyone, and the taxpayer of to-day has only himself to blame if he does not acquire a full knowledge of this all-important question. Lord Brassey's boundless hospitality, his warm heart, and his untiring energy will be greatly missed here, but, believe me, they are fully appreciated by those amongst whom he is now living.

The only fault that I can see in Lord Brassey—my only complaint against him—is the fact that he has made the position of President of this Institution a very difficult one for his successor to fill. When I was first offered this post I felt very diffident about accepting it. I felt strongly that there are many others, whose experience and training fit them so much better than mine fits me to undertake the duties connected with this position, but the knowledge that I should be brought in contact with the leading experts of that profession which has so greatly tended to make our empire what it is, that I should be privileged to hear them discuss subjects which have been of engrossing interest to me since I was a boy, was too strong a temptation for me to resist. I yielded to this temptation, and I can only now hope that I may justify your choice, and discharge the duties entrusted to me to your satisfaction and to my own.

It is now my duty to briefly allude to the chief events in the shipbuilding line which have take place during the past year, or are taking place at the present time. The most striking event of the moment, and the one which must be foremost in our minds just now, is the programme of construction just made public by the Admiralty. As you are aware, five new battleships are to be laid down: they are to be improved *Renowns*, their displacement is to be 12,900 tons. In offensive power they will be equal to the *Majestic* class; in speed and radius of action they are designed to have a slight advantage over that class, although their displacement will be some 2,000 tons less. Some apology would be due from me for giving these figures, which must already be so familiar to you, were it not that they recall to to my mind a very important point in the speech which your former President—Lord Brassey—delivered to you last year. He said, speaking of the *Majestic* class: "While fully recognising the superiority of the latest battleships, in a new programme it may not be superfluous to set forth the leading arguments in favour of keeping down dimensions, and distributing the fighting power of the fleet in a greater number of ships," and again, "as the ten ships now building are of the largest dimensions yet reached in naval architecture for war, our next batch of ten ships might well be of the type represented so admirably by the *Renown*." I quote these words of Lord Brassey with the utmost respect, and it would seem at first sight as though the designs of these new ships, which we are about to build, were in some degree a concession to the views of those who advocate moderate dimensions (a very elastic phrase) in our ships of war; but in my opinion they are a very direct and very excellent answer to those who favour a policy of building smaller ships than has been our wont of late. It is true that they are smaller by the size of a third-class cruiser than are the *Majestics*, but it has been necessary to make some sacrifices to attain this diminution of size. As far as I can learn, there is practically a consensus of opinion amongst naval experts, as also amongst our foreign critics, that the ships of the *Majestic* class embody in the highest degree all that is most desirable in a British battleship; but people will say, if this is so why not continue to build *Majestics?* No doubt we should do so, if the *Majestics* were suited to all of the multifarious duties which the British Navy has to perform. Events, however, over which we have no control, and the development of maritime powers which a few years ago were non-existent, have made it possible that our Navy may be called upon to act in waters unsuited to the great draughts of the ships of the *Majestic* class. For these reasons it has been found necessary to design the new vessels with two feet less draught than the class I have mentioned, and with a displacement of 2,000 tons less.

The four great requirements in a battleship are, without doubt, speed, radius of action, gun power, and defensive armour. History teaches us the importance which our forefathers attached to the weather-gauge. It was regarded by them as all-important to that fleet which hoped to assume the offensive; the weather-gauge of to-day is the power to out-steam the fleet of the enemy, the power to concentrate quickly, and bring on a general action at the most favourable moment. Coal supply, as limiting radius of action, is also of vital importance to the fleet which must keep at sea, and which must carry on operations at a great distance from its base. The gun power of these ships leaves nothing to be desired, as it equals that of their larger consorts. We now come to the price paid for the 2,000 tons of displacement taken out of these new ships. It is a sacrifice of about 25 per cent. of defensive armour. The development of the quick-firing gun and of high explosives makes it essential that the guns of the secondary armament and their crews should be properly protected; and it has, therefore, been decided to make the reduction in the side armour, which is to be of 6 in. instead of 9 in., as in the *Majestic* class. This, then, is the sacrifice which our designers have had to make, and it is considered to be the least harmful sacrifice that could be made under the circumstances. I must not forget to mention, too, that these battleships will be the first that our Admiralty have fitted with water-tube boilers.

I now pass to the cruisers projected in the new programme and here I feel myself in closer accord with those who advocate moderate dimensions; but, again—What are moderate dimensions. Ten years ago a cruiser of 10,000 tons would have been a monster. To-day it comes under the heading of moderate dimensions. The new cruisers are 11,000 tons displacement—that is, about mid-way between the *Blenheims*, of 9,000 tons, and the *Powerfuls*, of 14,000 tons. This excess of 2,000 tons over the *Blenheim* class would seem to be devoted to the attainment of a higher continuous sea speed, a more perfect system of protection to the guns and ammunition supply, and to the sheathing and coppering of the ships' bottoms, in order that they may be able to keep the sea for a longer period without docking. The considerable offensive power which these vessels possess would enable them to cope with anything afloat, save a modern battleship; and their great speed would enable them to avoid a conflict with an enemy superior to themselves. They should prove equal to making quick passages in heavy weather, and altogether they promise to be useful adjuncts to a fleet of heavy ships. I am quite aware that the wisdom of building these large and expensive cruisers without side armour at the water-line has been called into question, but I hardly think that this is a fitting moment to discuss such a subject. After careful consideration, after exhaustive experiments, and after availing themselves of the best expert advice at their disposal, the Admiralty have for some time past deliberately elected to discard side armour in all our cruisers, and to rely on armoured decks and coal protection.

In our new second-class cruisers we again find an example of the upward tendency of moderate dimensions. They are vessels of 5,600 tons, which is the precise size of the *Orlando* class—the belted first-class cruisers of ten years ago.

The Admiralty has also the intention of building a large number of third-class cruisers of the *Pelorus* type vessels of 2,135 tons displacement, and with a speed of 20 knots. Although, on the whole, their design has been approved of, it has been urged that they should have greater length, in order to improve their coal endurance. I would point out that, as matters stand, they will be 20 ft. longer than their prototypes—the *Bellona* class—and that their radius of action at 10 knots speed is calculated at 6,000 miles, which may be considered entirely satisfactory for cruisers of their size, being twice that of the *Bellonas*. They have also a higher freeboard, and so will be better sea-keeping vessels than the *Bellona*, and will carry a more powerful armament.

Any reference to the work in hand for the Royal Navy would be imperfect without a short notice concerning the torpedo-boat destroyers built or building in private yards for the Admiralty. They are the greatest novelty of our time, and each batch of these little vessels, when completed by the contractors, appears an improvement upon the last batch. To obtain a speed of thirty knots, or thereabouts, is such a marvellous achievement that the firms which have succeeded in accomplishing this feat deserve the highest credit, and the grateful thanks of the country.

Frankly, gentlemen, if we are to keep our place among the nations of the world, if our Navy is to continue in the future to be the prop and stay to us which it has been in the past, we must assure ourselves that our ships shall always be individually and class for class larger, better, faster, and more powerful than those of other countries.

In speaking of the work which has been done in connection with the Royal Navy during the past year, I cannot help referring to the extraordinary rapidity with which Her Majesty's first-class battleships *Majestic* and *Magnificent* have been built and fitted for sea. These ships, as you know, were completed within two years of the date of their being laid down—a wonderful feat on the part of the dockyard staff both at Portsmouth and Chatham. As I have already ventured to point out, these ships have won the entire approval of all naval officers, and they have exactly fulfilled the anticipations of their designer, Sir William White, who is about, I am glad to say, to return to his work restored to health after his long and serious illness, and I most heartily congratulate him and the distinguished profession to which he belongs upon this fact. Fifty-nine ships of war, with a total displacement of 148,000 tons, were launched in 1895, of these fifty-one were built in private establishments and eight in the Royal dockyards. These figures, of course, include warships built for foreign Governments.

I do not think that there are any special features to chronicle in connection with the development of the Mercantile Marine during the past year; 528 steamers with an aggregate tonnage of 905,000 tons and 53 sailing vessels with a tonnage of 46,000 tons, constitute the output of the yards of the United Kingdom.

Three points are apt to strike one when studying the development of the merchant Navy; the steady increase of steam tonnage, and the equally steady decrease of sailing tonnage, the substitution to a greater extent each year of steel in place of iron as the material used for construction, and the greatly enlarged size of cargo steamers.

The net increase during the past year in the tonnage of the world for mercantile purposes amounts to about 518,000 tons.

Turning to the programme of the proceedings of our present session I venture to think that it bids fair to be a very interesting one.

Two papers upon the subject of water-tight doors in warships are to be read, one by Lord Charles Beresford, and the other by Colonel Soliani, Director of Naval Construction, Royal Italian Navy. I think that nothing could better illustrate the advantage of an institution of this sort than the facility which it gives for an interchange of ideas between those who design the ships and those who have to use them.

Mr. Seaton's paper on the use of the microscope for revealing the cause of mysterious fractures in steel, proves to us that the engineers of the present day fully recognise the necessity of availing themselves of all the resources of science in improving their practice. The information gained from a study of this subject must be of great practical advantage, and we may hope that ere long railway accidents, such as the one that happened to the Great Northern Express at St. Neots some months ago, and which was directly traced to the breaking of a rail, may be rendered impossible, and many valuable lives saved.

There are no less than three papers down on our programme which deal with the question of water-tube boilers, a most important one at the present time.

While the programme thus contains many papers of great practical importance, the theoretical side of naval architecture has not been neglected. Mr. R. E. Froude follows up a subject with which his father's name is closely identified, by giving a paper on the rolling of ships. A Russian gentleman, Captain Kriloff, contributes a paper on the kindred subject of the pitching of ships, and from Mr. Bruhn we welcome an able paper on the ever-interesting subject of stability. The numerous losses of grain-laden vessels in the past have called forth a paper from Mr. George Little, which, it may be hoped, will draw attention to the subject.

In concluding, gentlemen, I must ask you to forgive me if my address does not appear to you worthy of so important an occasion, if the ideas which I have ventured to place before you have seemed crude and half-formed. It only remains for me to remind you of the difficulties which confront a layman when addressing an audience of composed of experts, and to thank you in no formal sense, but in all sincerity, for the kind and patient hearing which you have given me.

The first paper read was on "Watertight Doors and their Danger to Modern Fighting Ships," by Captain Lord Charles Beresford, C.B., R.N. The second paper was by Colonel Nabor Soliani, Director of Naval Construction, Royal Italian Navy, member, both of which papers we refer to in our Editorial Notes.

On the proposal of Lord Charles Beresford, it was agreed to take the discussion on his paper and on that of Colonel Soliani at the same time, and this was opened by

Rear-Admiral Wilson, who, having stated that all Naval officers will admit that the service is indebted to the readers of the two previous papers, proceeded to give some points of what he considered paramount importance in the arrangement of doors and bulkheads, which he thought should be so placed as to render a ship safe from the attack of any one torpedo or one collision. The gallant officer was of opinion that while communication must be maintained from the captain to all parts of the ship, and from each gun to its own particular magazine, the communication ways should be kept at a high level, and emphasised the necessity for keeping doors shut by saying that, as ship is generally hit when least expected, and as you cannot close doors with water in a ship, they should be closed before she is hit. The speaker gave some very interesting figures regarding the heel, immersion, &c., of a ship with different compartments flooded, based on calculations made by him on, and when commanding, H.M.S. *Sans Pareil*.

Sir Wm. White, who received quite an ovation on his rising to speak, commenced by stating that he had come without medical leave to take part in the discussion. Though he had been allowed every opportunity by the French Government to see what they were doing in this matter of watertight doors, he could not, in common courtesy, do otherwise than decline to divulge what he had seen or heard, nor could he enter into any defence of the principles adopted in the ships for the designing of which he was mainly responsible. Dealing with Lord Charles Beresford's paper, Sir William said that if the naval officers did not like the doors, they could always keep them shut, and instanced how, in a vessel of the *Royal Sovereign* class, the officers working her suggested that *one* door might, in their opinion, be advantageously done away with, and pointed out that while cutting a hole in a bulkhead would weaken it, there are compensating elements of strength which must be taken into consideration, so that a door properly fitted and closed does not weaken a bulkhead. Passing on to the question of what are the requirements of the number of doors and considerations of their positions, the speaker referred to the loss of the *Vanguard* and Sir Nathaniel Barnaby's advocacy of less and higher doors more than 20 years ago, and instanced how, following on this, ships were built with fewer doors and higher [illegible], until the demand was made from officers and engineers for more doors and a lower level of communication. The ideal ship, said Sir William, should have no openings, but that ideal cannot be realised, and consequently there *must* be doors, and the problem to be solved was, how many? and this was one of the most serious questions for both the naval officer and the naval architect to face. The present arrangement of doors in our ships was the result of experience gained afloat, and were fitted at the repeated requests of officers serving in them. The speaker pointed out that there were also questions of habitability and ventilation that could not be ignored, and thought that Lord Charles had looked hard at one thing, and one thing only.

Lord Charles spoke of the collision bulkhead being placed further aft, as a matter of fact all our ships have two collision bulkheads. With only such openings between decks as Lord Charles advocated there could be no quick communication. He shared the feelings of all the technical members of the Institution in welcoming Lord Charles's paper, though he did not agree with it. Colonel Soliani had contributed the second paper at his request, and it appeared to him a most thoughtful summary of the whole question. Colonel Soliani had kindly come all the way from Italy on purpose to read it, and they all most cordially thanked him for it.

Admiral Fitzgerald differed from Lord Charles, and said that the controversy was an old one, but now the conditions were reversed, for it used to be the constructor and not the naval officer who wished to abolish the doors. The safety of the warship depended to some extent on the fighting efficiency, and the latter was greatly increased by ease of communication, in fact the commutative convenience of the crew made up the fighting efficiency of the ship.

Admiral Freemantle said that the whole question was, of course, an old one, and that the habitability and health of the ship should be considered, and in this matter he thought the doctor ought to be considered as well as the executive officers; the speaker further said that in his ship, the *Centurion*, the doors were easily and satisfactorily closed, and were frequently opened, as the men and doctors complained about ill-health when kept closed for long periods.

Admiral Colomb thought the general consensus of opinion of those present was with Lord Charles, and agreed that the fewer doors the better. He thought there should be more closeness between the naval officers and the designers in the initial stages. Sir William White, the gallant Admiral said, had exhibited his usual brilliancy and adroitness. If Lord Charles had foreseen the result he would probably have said, "An I had known he was so cunning of fence, I would have seen him damned ere I would have fought with him." He trusted that the practical result of the discussion would be to bring the designer and the officer into closer contact.

Mr. Martell, speaking from the Mercantile Marine point of view, sympathised with Lord Charles very much indeed in his remarks. He, the speaker, would not allow the perforation of any main bulkhead, and thought the safety of the ship of greater importance than the convenience of her crew. He would even go so far as to take main steam pipes up and over a main transverse bulkhead rather than through it.

Mr. Seaton said that earlier in the day the contest appeared to be between the naval architect and the naval officer, but the attack was now turned on the unfortunate engineer, of whom he was one. Going back on ancient history it might be well to remember that the *Royal George* was lost, with 800 men, through her watertight doors (*i.e.*, gun-ports) being left open. He remembered the *Black Prince* running into the *Royal Oak* in '66 or '67 and disjointing her forepeak, and that ship carried her forepeak full of water for more than a quarter of a century without anyone knowing of it. In vessels constructed under his supervision he insisted on the bulkheads between engine and boiler rooms being left unimpaired, and fitted mechanical telegraphs between engine and boiler rooms, and vessels so fitted have run satisfactorily for a considerable time now. He entirely agreed with Lord Charles Beresford's views, and wondered in these days of science telephones were not fitted on Her Majesty's ships.

Professor Byles thought the difficulty might in part be overcome, if where beam allowed it, three or even four sets of engines were provided, and each enclosed in its own separate transverse compartment. He also referred to certain Atlantic liners designed by him, and which were without doors in the bulkheads.

Mr. Gearing related how he had driven a large vessel, one of those designed by Professor Byles, having engines of 18,000 I.H.P., across the Atlantic at twelve knots, and with seven out of her eight feed pumps *hors de combat*, without having any occasion to regret the entire absence of watertight doors between the engine and boiler compartments, all orders being given by voice-pipe, and could not see any reason why doors should be put in warships, in fact, thinks the contrary. Admiral Sir John Hay pointed out, with reference to the part taken by naval officers in the design of ships, that the Director of Naval Construction was not autocratic, for, as a matter of fact his superior at the Admiralty was a naval officer, namely, the Controller of the Navy, who, in conjunction with the First Naval Lord, virtually controlled the design of a ship, they both having to put their signatures to the drawings.

Mr. Thoms said that in his opinion there were much better doors in the market than those fitted by the Admiralty, and supported his contention by exhibiting and explaining a model of an improved form of door, which has been fitted to three (Foreign ?) first-class cruisers.

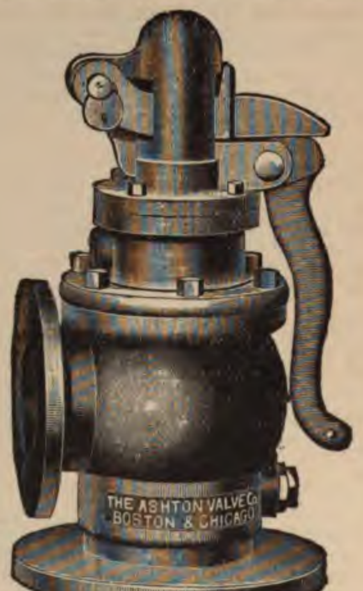
In his reply, Lord Charles Beresford thought that from the result of the discussion he was justified in bringing forward the paper. After generally traversing Sir William White's remarks, the noble lord caused considerable amusement by stating that naval officers and crews were very naturally interested in this question, as they went to sea in the ships and took the risks of them turning upside down, while the naval constructor had nothing else to do but sit quietly at home and explain to the public how the accident occurred.

Colonel Soliani having stated that he fully agreed with Lord Charles Beresford that there should be as few watertight doors in a war-ship as possible, the Chairman proposed a vote of thanks to the readers of the papers, which was duly carried.

The Right Hon. the Earl of Ravensworth having taken the chair, Mr. Bruhn proceeded to read his paper "Some Geometry in connection with the Stability of Ships." This was a purely mathematical paper, and the discussion on it was limited to a few remarks from Professor Byles and Mr. Martell, the customary vote of thanks to the reader bringing the day's proceedings, so far as business was concerned, to a close.

THE ASHTON "LOCK-UP" SAFETY VALVE.

THE Americans, having given us something to think about in their new design of quadruple-expansion engines, consider also that they are hard to beat in many other engineering details, both in neatness of design, reliability, price and workmanship.



As a sample of this we illustrate herewith a new type of the now popular Ashton marine "Pop", safety valves. As will be seen from the illustration, the design is very neat and compact, the hand lever for "popping" the valve being close down to the valve casing and lifting the valve by a cam action. The workmanship is excellent, great care having also been taken in the selection of the material to ensure reliability in use.

The metal of which these valves is composed is a special alloy, and stated to be absolutely non-corrosible, the ordinary acids and salts not touching it in the least. This, as we know, is an important point in the case of valves, which may not be frequently operated, but which are required always to be in the same efficient condition as when put down. The valve is spring-pressed and the springs are specially manufactured of Jessop steel, great care being taken in the hardening and tempering to ensure best quality and reliability. The springs are also subjected to the very severest tests before being fitted.

The seats of these valves are bevelled at an angle of 45 deg., and the lever is made to lift the valve off its seat to the extent of one-eighth of the diameter of the valve opening which is required by the United States Board of Supervising Inspection of Steam Vessels.

The valves can be set or re-set at any desired pressure by removal of the cap, after unlocking the padlock, by setting up or down a nut and check-nut, but otherwise when set and locked it cannot be tampered with. The variation between opening and closing pressures can also be adjusted to the amount desired.

Although the above pattern has been selected for illustration as that most suitable for a marine lock-up valve, the Ashton Valve Co., 34, Queen Street, London, have a large variety on stock at their showroom, for all purposes and in all sizes, where an inspection would well repay a visit.

THE FLEETS OF THE MAIL LINES.

(*From our own Correspondent.*)

New Atlantic Competition.

LIVERPOOL scored another point on Wednesday, the 26th February, when the up and down specials for the inward and outward White Star boats were, for the first time, accelerated to do the journey in four hours. The run between Euston and the Riverside station, whence the time is taken, is made with a single stop at Crewe, and this is to be the time and the stopping schedule for the American expresses of the North-Western Railway in the future. We are apt to think that while constant progress is being made with the acceleration of steamships the railway is standing at its speed of years ago, save when the railway races put managers on their mettle. Here is an instance that things are not so. It will be remembered that there was a railway race to Scotland in 1895, and one a few years previously. I forget the exact year but on that occasion the North-Western had the last word by running a light train from Euston to Crewe without a stop. The performance was not repeated. It had no need to be. It was the last word of the contest, and an argument that could have no reply. Now we see after a lapse of a few years that this then phenomenal run is to become every-day practice, and that with the American specials, which—as I pointed out a few issues ago—are very far from being light trains. The report of the Conservator of the Mersey shows what 1895 has done for the improvement of the port in regard to the Atlantic competition. It appears that formerly there was as little as 8 ft. of water in places at the north end of the Prince's landing stage, where the big steamers now lie to embark their passengers. At present the depth has been increased to 26 ft., and the intention is to continue deepening the berth till the depth of 30 ft. is reached, which, of course, is enough to a commodate any vessel at present afloat and that with a good margin. From June till the end of the year no less than 172 steamers availed themselves of the facilities offered them at the stage. This is an average of about one a day. As to the Bar, nothing but Southampton's jealousy can say that it still exists. The minimum depth at low-water spring tides is 22 ft., but this is only in a few patches at the outside of the cut, and it does not effect the passage at mid-channel where there is a cut of 500 ft. in width with a minimum depth of 24 ft. at low-water spring tides already. As everyone knows, the range of the tide is considerable at Liverpool, and it would therefore be hard for any vessel to be kept waiting off the Bar now. And this result has been achieved before the latest and most powerful dredger of the Dock Board has had time to do much in the matter. With the appliances which they now have it will be surprising if the present summer does not allow such progress to be made as to enable Liverpool to say justly that any vessel afloat can enter the port at any state of any tide, and that without raising the mud as I have seen big vessels do at other places.

Overdue.

It is sometimes well not to be quite abreast of the times. This was the case with the Pacific mail steamer *City of Rio Janeiro*, which caused considerable anxiety as to her fate early in March when she was seriously overdue on her usual trip from San Francisco to Yokohama. She eventually reached Honolulu in safety. The cause of her delay was shortness of coal, and she reached port by the aid of burning her deck-houses and topmasts. She is a big steamer of nearly 4,000 tons, built at Chester, Pennsylvania, by the firm of John Roach & Co., in 1878. Vessels of her standing and size built in European yards are not apt to have wooden deck-houses or movable wooden topmasts. They would be reduced under such circumstances to burning cabin bulkheads or deck planking. But the opportunity of such a catastrophe is not likely to arise on this side of the American continent, where the seas are so much more frequented. The only serious case of shortness of coal which I can remember was that of the *Loch Maree*, whose crew abandoned her on account of alleged shortness of supply. She was, however, brought into port in safety by salvors, and her officers were blamed for not standing by her.

Old Tonnage and New.

Whilst in Liverpool during the month of March, I had the opportunity of spending a considerable amount of time upon the new White Star steamer *Georgic*. This vessel, for the present at least, holds a unique position. As has already been stated in these columns, she is the biggest ship of any class or country afloat. Her position in this regard is as indisputable as was that of the ill-fated *Great Eastern*, though she does not, like her, stand at a point lengths and lengths away from others. Her gigantic size would, therefore, alone entitle her to great consideration, but she claims our attention on other and even more important grounds. We see in her the embodiment of all that the skill and experience of Messrs. Harland & Wolff and of her owners can suggest for the cheap handling of the live and dead cargoes which form the bulk of the Atlantic trade. The *Georgic* is, to my mind, quite as wonderful a production as the *Teutonic*, the *Lucania*, or the battleship *Majestic*. What she embodies in the way of improvements of a space of seven years has made it desirable for the White Star Company to part with their *Runic* as, *for them*, out-of-date. We are driven, on regarding the points of a modern first-class cargo boat, to ask ourselves, how will it be possible to carry improvement further. Yet we may be sure that it will be done, and that the *Georgic's* day of pre-eminence will not be greater than the *Runic's*. But we are also driven to consider how anyone who has seen her, or any of the very numerous modern cargo boats now being turned out with dead-weight capacities ranging to 10,000 tons a piece, can ever suppose that any of the old compound boats with their expensive engines and their small earning capacity can ever be anything but sources of expense and of loss to their owners. We are told that some owners are holding on to their old tonnage and paying laying-up dues on its account year after year, because they look to get a better price for their useless stuff when times mend. This hope is a very delusive one. For times can never mend to any sensible extent when there is a mass of unemployed tonnage hanging over the market ready to come out and drown the improvement as soon as it shows its head. Moreover, the improvement of vessels of this class is not likely to stand still, and, whilst the markets are not appreciably improving, the laid-up vessels are becoming less and less equal to customers' requirements. Their values are becoming less and less, and the sooner these obvious facts are realised by those unfortunate enough to possess old steamers the sooner will they be able to make a fair start again without encumbrance, and with vessels which are capable of making a living wherever there is a living rate of freight to be found. I have recently been looking at some statistics of 20 years ago, and noticed that it was not till then that the owners of old paddlers realized the worthlessness of their possessions. At all events, it was at this time that a vast lot of antiquated craft were broken up, and the time is now ripe for another generation—the small compound screw cargo boat—to be swept completely away.

Lengthening a Record Breaker.

The results of the experiment which Messrs. Harland & Wolff are carrying out with the *Scot* will be awaited with much interest. As readers probably know ere this, she has already been cut in two and drawn asunder almost amidships and an extra length of fifty feet is to be given her. This is a job surpassing anything hitherto attempted. The largest vessel on which such an experiment has hitherto been tried was, as far as I know, the P. & O. liner *Rome*. This was a vessel built in 1881, when she was the premier boat of her fleet. Her length was then 430 ft. and her gross tonnage 4,885. In 1891 she was improved by having her engines tripled, new boilers provided, and a new bow being built for her which increased her length 19 ft. She was now of a gross tonnage of 5,545. It was said at the time that the sister ship *Carthage* was to be similarly treated, but I am not aware that the intention was ever carried out, and this leads one to infer that the results of the experiment were not as satisfactory as were anticipated. But the experiment with the *Scot* is a much bolder one. Here is a vessel whose age is not yet half that which the *Rome* had attained at the time of her alterations. Her original gross tonnage was 6,844, which is just 2,000 tons greater than that of the *Rome*. Her length, however, is only 477 ft., with a beam of 54 ft., which seems somewhat short and beamy. The later ship *Norman* has a few inches less beam and 13 ft. greater length than the *Scot's* original design, so that the altered vessel will be some 37 ft. longer than she. But it is not only in regard to the dimensions of the subject that the experiment will be interesting. It will be an unprecedented thing to see a vessel of the *Scot's* speed and remaining pre-eminence, after such alterations, and it will be of the greatest interest to see how her speed is affected by the change. If it be not sensibly reduced the expense and trouble taken will be well rewarded, for all the addition will be practically an increase of earning power. Such an event would indeed justify Messrs. Harland & Wolff in their preference for long, narrow models, even beyond the comparison of the *Teutonic* and the *City of New York*, which was flattering enough to the Queen's Island draughtsmen.

Changes in the Fleets.

I see that the *City of Lincoln* is announced for sale by private treaty. She, of course, was in former days a Guion liner. It is a curious thing that she should be in the market at the moment, for of the once extensive fleet of the Guion Line, a line which was adding vessels of the finest class to its lists until comparatively recently, only four vessels remain, I do not merely mean under its flag, but remain in existence at all. Two of these are still in the hands of the old firm and two have found other owners. Yet all four are for sale by private treaty at the moment; three of them have previously been offered at auction.

A curious fate has befallen a fine steamer, the *Wieland*, once a well-known Atlantic liner. She was sold out of the Hamburg-American fleet and sent to the East. At Singapore she put into port with her cargo well alight, and all attempts at extinguishing it being futile she had to be scuttled. She was afterwards raised, her cargo, or what was left of it, discharged and the vessel sold by auction. According to a recent telegram it is decided to use her for the purpose of lengthening the breakwater at Singapore. One has heard of small vessels being used as piers, but, I think, this is the first instance of a big steamer meeting with such an ignominious, if useful, fate.

Publications.

I have received a little pamphlet from Messrs. J. & H. Gwynne & Co., containing some very interesting illustrations of their well-known pumping machinery, and, of what will interest all readers of this column, the use to which their appliances are put for the salvage of steamships, stranded or sunk. A number of illustrations are given of vessels in difficulties and of the method in which they were prepared by the salvors for the work of being pumped out by these powerful and rightly styled "Invincible" pumps. I will only cite two cases out of the many referred to. One, the celebrated *Wick Bay* case, where a vessel, which had long defied all attempt at moving her, was at last shifted though she had lost most of her external resemblance to a vessel. The other shall be the well-known case of the Anchor liner *Utopia*, sunk in Gibraltar Bay by collision with the bows of one of Her Majesty's battleships. Not only was the latter vessel sunk to a considerable depth and wounded very largely by the warship's ram but the operations were further impeded by currents. Yet the *Utopia* was not only successfully raised but was restored to her former employment.

"An International Ocean Race"

is the heading under which an amusing episode in the life of one of the Canadian Pacific *Empresses* is given. The account is extracted from a San Francisco paper whose bias would certainly not be in the favour of the British ship. On the 21st January the *Empress of India* was lying at Kobe, so was the United States' commerce destroyer *Olympia*. The latter was boasted to have done 22 knots in a heavy gale, when the seas smashed the glass in the wheel-house, and did other deck damage of a more or less serious kind. This naval flyer left Kobe for Nagusoki at 5 p.m. on the day in question. Five hours later for the same port left the British merchantman, whose guaranteed speed on the measured mile was a humble 17½ knots, falling to 16 knots for a sea speed. Yet at 11 a.m. on the following day the *Olympia* was sighted by the Britisher. Five hours at 22 knots means 110 miles, and it should have meant more as the 22 knots was storm-speed, and the weather on the present occasion was all that could be desired. What the speed of the *Empress* must have been to have gained 110 miles or upwards on a 22-knot steamer in 11 hours I have not troubled to calculate, because I know that the *Empress* would not pretend to anything she could not do, and therefore it follows that the Yankees had done the "blowing." The *Empress* eventually passed the boaster, and went away from her. This is unfortunate for the American people who pay so heavily for their little navy that they might expect to have it efficient, but it justifies our Admiralty in its reliance on the Subsidised Merchant Cruisers, of whom this *Empress* is one, and it should surely suggest to our authorities that they might wisely add a few more such vessels to their list of armed merchantmen. They will find no difficulty in discovering in the British Merchant Navy List plenty of steamers built to the requirements of the Admiralty. That Department must, however, take to heart the lessons to be derived from its experience in the case of the *City of Paris* and the *City of New York*, and make it a condition of the contract that the vessels subsidised shall never be transferred to a foreign flag.

The Allan Line

is the one I had chosen for the subject of this month's note. It will be the first of which I have had to write without any assistance from the owners, for Messrs. Allan's are the first shipowners to whom I have applied for information and not had even the courtesy of a reply. When one begins to go into the history of the line one begins to understand that the agents and owners may well think that the less attention is called to them the better. The early history of the service between Liverpool and Canada in the fifties was simply a record of disaster, though it was disaster met with unlimited courage, and disaster caused by circumstances over which the shipowner had no control whatever. Take for example the loss of one of their mail boats at Cape Race. The place was known to be dangerous, and to be inefficiently protected by warnings. The New York underwriters had gone so far as to offer to place a sound signal on the head. This offer had been refused by the British authorities. Then came the loss of a fine new mail boat through the want of the despised foghorn, and, no doubt, the responsible officials felt as little perturbed at the results of their stupidity, as officials do in like cases to-day. Gradually the firm built up a great business. Not only was there a weekly mail service from Liverpool, *via* Moville, to the S. Lawrence, in summer, and to Halifax in winter, but Glasgow and London were also made points of departure. Other trades were opened up, such as the service to the River Plate, the services to various United States and Canadian ports, and the line went in the forefront of improvement, for one of the earliest big ocean steamers to be built of steel was an Allan liner. Then all at once it seemed to crystallize.

The London trade has made the line absorb several well-known vessels built for other owners. When the Monarch Line came to an end, its fleet was taken over and divided between the Allan's and the Wilson's, of Hull. So too at Glasgow the Allan's took over the pick of the State Line boats and absorbed them into itself.

But it is with regard to its mail service that we are chiefly concerned here, and the position cannot but be considered disappointing. The Allan Line is undoubtedly the premier line between Great Britain and her nearest colony, the large and important Dominion of Canada. Yet though there are two vessels of nearly 5,000 tons each, built within the last five years in the mail service, the crack boat of the line is the *Parisian*, built fifteen years ago, whilst the old *Polynesian*, built nine years earlier, still figures in the mail sailing list, though her name is charged and her machinery has been renewed. The *Parisian* is a fine vessel of 5,365 tons gross, built by Messrs. Napier, a very comfortable ship for those who are not in a hurry. But she has no more right to her position as crack mail carrier between England and Canada than has the newer *Kensington* to carry the New York mails. The American Line calls the *Kensington* a cargo boat, but her speed is much on a par with that of the *Parisian*. The actual record in the St. Lawrence trade, such as it is, is held by the Dominion Line with their steamer *Labrador*. But it is a thousand pities that there are no such boats in the Canadian Atlantic service as are the three *Empresses* on the other side of the Continent. There was a time when the speed of the mail boats to the St. Lawrence was almost equal to that of the New York liners, and if these times could come again we might see a great passenger traffic on the St. Lawrence, and much of the money now spent on American ships and American hotels diverted to the benefit of our fellow-subjects. Of course those who have large fleets capable of earning what their owners desire are not the people to launch out in a new direction. But we may be quite sure that in spite of the well-advertised "dangers of the St. Lawrence," the Dominion Government will eventually get their mails carried in modern ships, whoever may be the contractors, and there will then be a great alteration in the conditions of the trade and in the vessels engaged in it. The possession of speed cannot be a source of danger, as the Messrs. Allan argued. It will be conceded to them that the improper use of that speed may be dangerous, but so, too, can be the improper use of anything they may choose to name.

THE UNIVERSAL HIGH-SPEED STEAM ENGINE.

UNDER the above title the Brush Electrical Engineering Co., Limited, are putting on the market a novel type of high-speed steam engine, which has been designed and patented by Mr. Raworth, their chief engineer and manager.

The objects in view during the designing of this engine were, we understand, the following, viz.:—That the working parts should be enclosed but readily accessible, that all wearing joints could be set up in a few minutes without filing or fitting, that the lubrication should be automatic, that the governing should be as perfect as possible, and that the construction should be such as to give great economy in steam and oil.

We illustrate this engine, and some of its details, in the adjoining diagrams, of which Fig. 1 is a perspective view of the engine coupled to a Mordey-Victoria dynamo for generating alternating current; Fig. 2 is a cross-sectional elevation; Fig. 3 is a section on the line A B, Fig. 5; Fig. 4 is a section of the line C D Fig. 5; Fig. 5 is a longitudinal sectional elevation; Fig. 6 is a view of the connecting rod; and Fig. 7 is a set of indicator diagrams taken at full, half, and no load.

This engine, in a general sense, is essentially a tandem engine. It can be arranged either simple, compound, triple, or quadruple expansion, according to requirements.

The cylinders are arranged in pairs one above the the other, and the valves are placed between the cylinders.

The valves are of the Corliss type, and the high-pressure valve is distinct from the low-pressure.

The high-pressure steam presses on the under surface of the small upper piston, and the expanded or receiver steam presses on the upper surface of the low-pressure piston.

During the down stroke, to the point of cut-off, the receiver and the high-pressure cylinder are in communication with the low-pressure cylinder.

The high-pressure piston at the top of its stroke passes ports in the cylinder, whereby the pressures in the cylinder and in the receiver are equalised; but the capacity of the receiver is so arranged that the difference in pressure between the high-pressure cylinder and the receiver shall be small.

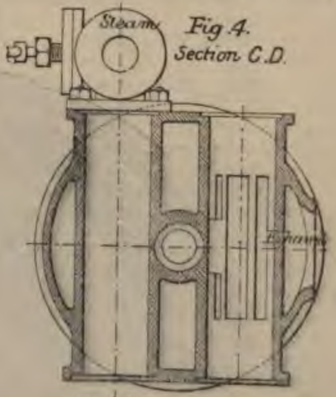
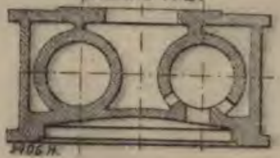


Fig 4. Section C.D.

Fig 3. Section A B.



The high-pressure cylinder steam on the downward stroke of the piston expands into the low-pressure cylinder until the cut-off valve closes, when the remainder is passed into the receiver, excepting a small residue retained for compression.

Any water taken into the high-pressure cylinder is discharged into the low-pressure, and when the low-pressure piston arrives at the bottom of its stroke, the water is discharged through holes in the cylinder into the lower exhaust chamber. The exhaust valve is connected with the lower exhaust chamber by an external pipe. The main exhaust pipe is carried away at the lower level, and, when working non-condensing involving an upward turn of the pipe, a large drain pipe is taken downwards before the exhaust pipe arrives at the first upward bend. Triple-expansion engines are arranged with two pairs of cylinders and two cranks. The high-pressure and intermediate cylinders are placed in tandem over one crank, and two low-pressure cylinders are placed over the other crank.

Quadruple-expansion engines are arranged with two pairs of cylinders and two cranks, each pair of cylinders being arranged and connected as described for the compound engine.

The following description of details applies to the compound engine as shown in the diagrams, with one crank, and only incidentally to the triple and quadruple engines :—

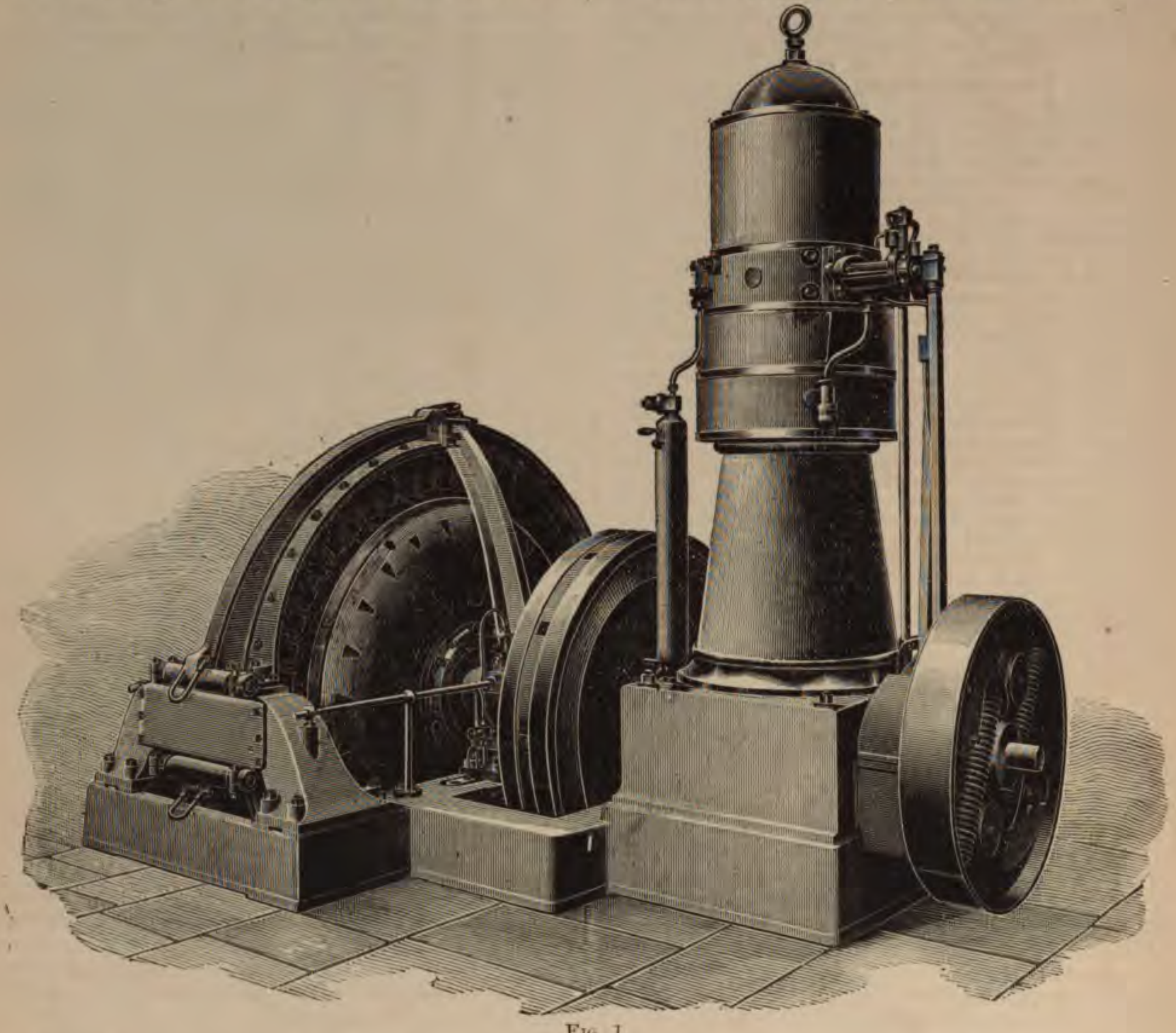


Fig. 1.

The cross section of the engine on the centre line at right angles to the axis of the crank shaft (Fig. 2), shows only the port in the low-pressure valve between the high-pressure and the low-pressure cylinders. The port which communicates between the upper side of the low-pressure piston and the receiver is behind the parts shown in section. It is shown separately in Figs. 3 and 4.

The valves are worked by two eccentric rods acting on levers attached to the valve spindles. The high-pressure eccentric is driven by a centrifugal shaft governor, which controls the cut off from 0 to ⅝ stroke the low-pressure eccentric is fixed on the shaft and is set to cut off at about ½ stroke.

The lubrication is entirely automatic. The crank pin is lubricated by the oil bath in the base. The joints and bearings of the valve levers and spindles, also the piston rod, guides and crosshead are lubricated by a small double-spur-wheel pump which takes oil from the crank pit and distributes it to the various joints and bearings. The cylinders are lubricated by means of a large displacement lubricator, which holds a month's supply of oil. The construction of this engine is such that its truth—*i.e.* the perfect alignment of the cylinders, crosshead, guide, and crankpin —is ensured by machine work, and is in no way dependent on manual skill. The crank shaft is of Siemens-Martin steel annealed after rough tooling, and balanced as far as practicable opposite the crank. The main bearings are fixed in solid seats in the base-plate casting, bored by a special machine which ensures absolute squareness with the centre line of the cylinders. The bearings are held down by wedge pieces drawn up by external screws. There is also an adjustment to take up end wear, should any occur.

We now come to an interesting portion of the mechanism of novel design, viz., the connecting rod, which is in two separate parts, as shown in Fig. 6, the external frame transmits the pull on the up stroke and the internal strut takes the pressure of the down stroke. The external frame is made of a fixed length, but the internal strut is provided with a powerful screw adjustment by which any slack can be readily taken up. This facility in taking up wear entirely prevents knocking, and thus renders the running of the engine at all times quiet. When the engine is at work the adjusting screw is clamped tight and cannot work loose.

The crosshead pin is hollow and is designed to be perfectly tight in work and yet quite loose for removal. The pin is hollow and is a free fit in the hole in the crosshead, but the ends are bored conical and split.

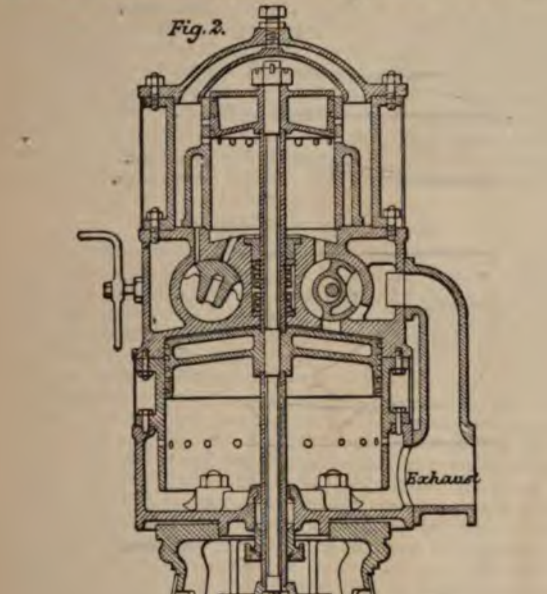


Fig. 2.

To fix the pin the two cone plugs are drawn up tight by the bolt, and thus expand the pin in the bearing holes. The attachment of the piston rod is such that the piston rod can always be drawn out from above. The end of the piston rod is screwed and fitted witha conical nut in halves.

To get the rod out it is only necessary to unscrew the top nut and let the rod down a few inches, when the lower nut falls off and the rod can then be lifted

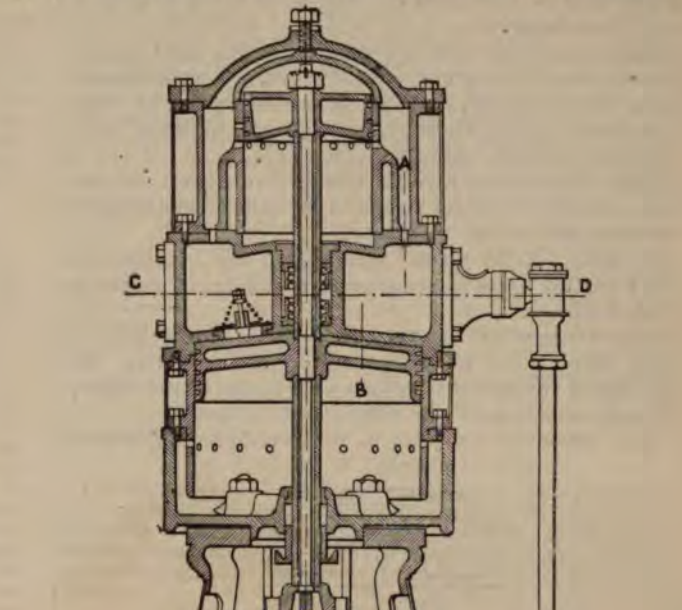


Fig. 5.

The piston rod casings are of cast iron, in order that they may wear perfectly smooth and free from ridges and grooves.

The bottom gland is forced into position by a loose frame which will not put any cross-wind on the gland, however irregularly it may be screwed up.

The bolts also are made more accessible by being brought nearer to the outside of the engine.

The high-pressure valve is of the ordinary Corliss type.

The low-pressure valve is similar, but more nearly resembles a Wheelock valve.

Both patterns have been proved, by many years' experience in hundreds of engines, to work well with very little wear.

Trip gear is not used on account of the high speed, but the shaft governor cut-off gives, we understand, even better results, as it throttles the steam at very light loads, giving thereby, according to Willans' law, the conditions of maximum efficiency.

The high-pressure valve admits live steam to the high-pressure cylinder and cuts off under the action of the automatic shaft governor.

It also admits steam directly to the receiver for warming up when the engine is standing or running at slow speed.

The receiver port is very small and narrow and is only open in the extreme position of the valve. At full speed the governor reduces the travel of the valve, thereby shutting off the supply to the receiver.

The eccentric-rod joint is, we think, one of the best features in this engine, as it is not only simple and effective but very easy to set up.

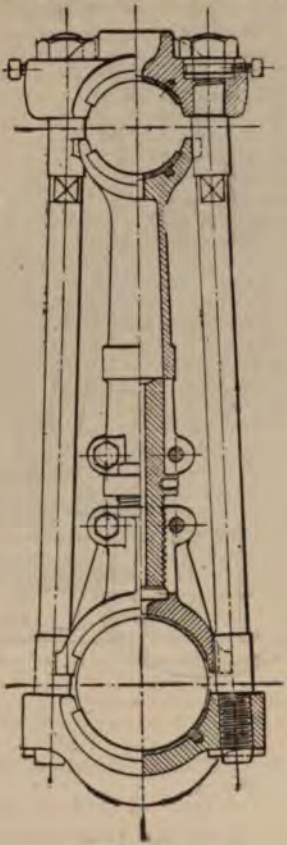


Fig. 6.

The pin is spherical and the end of the rod is fitted with two cylindrical white metal pads with hollow spherical faces, which grasp the pin and are set up by a large screw cap.

Any excess of oil passes down the eccentric rods which are hollow to the eccentrics, and thence to the crank chamber.

The governor is in principle an ordinary crank-shaft automatic cut-off governor, but it has many improvements in detail. It has only six parts, viz.: the wheel, the banjo, two weighted arms, and two springs. The springs are fitted with an adjustment which enables the user to alter the range of total variation in speed from one-half per cent. to about five per cent.

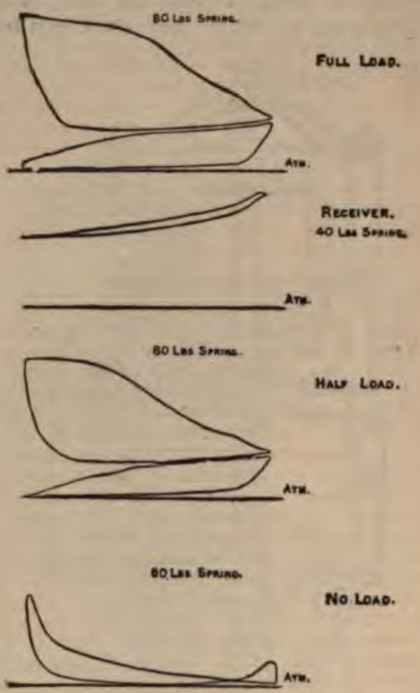


Fig. 7.

The manufacturers claim that its action is theoretically perfect, as at light loads it combines the effect of throttling with that of expansion; and in this respect is superior to the ordinary Corliss trip gear, and in all other respects is quite equal thereto.

We think that it will be generally admitted that considerable success has attended the efforts of the designer of this engine to overcome many of the disadvantages that obtained in the engines that have been available up to the present time, especially for use in cases where high speed, steady running, and great durability are required with high economy.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our own Correspondent.)

The New Naval Programme.

LARGE as the estimates for naval purposes unquestionably are, and showing as they do a considerable increase over those of last year, the only kind of criticism heard about them, outside the Peace Society, is—are they sufficient? No better proof of the frame of mind in which the public regard the subject could be wanted. The days of panic—at least for a time—are passed, and all the country wishes for is that the naval requirements of the Empire in every department should be satisfactorily met, independent of the cost. Indirectly this is also evidence that the people believe that in spending money on the *Fleet* they are getting twenty shillings worth for a pound, and that although mistakes have been made and organisation is yet imperfect, still the system is, on the whole, good, and in capable hands can be made to render successful results. Looking all these facts in the face, the First Lord of the Admiralty was quite right in speaking of his proposals as "sober estimates." For the first time in the annals of Naval administration, for many a long year, money was not the primary consideration. The proposals seem to have been, as Mr. Goschen claimed, based, not on what could be afforded from a Chancellor of the Exchequer's point of view, but on what, after due forethought, careful deliberation, and an adequate allocation of means to ends, was considered by the Ministers and their professional advisers to be needed after a general survey of the situation. These proposals, some of which are of a radical nature, are now still under discussion; but there can be no doubt that, taken as a whole, the Estimates for the Navy are considered satisfactory, and, in a sense, sufficient. That the details of the scheme should be subjected to criticism is merely an additional sign of the exceptional interest felt in all which concerns the Sea Service.

The Shipbuilding Scheme.

In all proposals for a renewal or improvement of the Fleet, ships must have the first place. Upon the number and design of the ships all else depends. This is the factor which determines the number of officers and men, of guns, and of stores and equipment, including docks, and even the amount of protection necessary for the docks and arsenals. Therefore to the number of ships in Mr. Goschen's scheme we will first devote consideration. The programme is not large if we compare it with those of some previous years, but the question is not so much how it looks in this respect, as—is it adequate? It includes forty-six vessels, of which all but twenty-eight are battleships and cruisers. There are five battleships, of which three are to be laid down in the Government establishments, and two which will be contracted for. Four first-class cruisers, of which three are to be built by the contract and one in a public yard. Three second-class cruisers are to be built by contract. Six third-class cruisers, one of which will be built at Sheerness, and of the remainder, two at Earle's, two at Palmer's, and one at Elswick. Twenty-eight torpedo-boat destroyers, all to be built outside of the Government establishments. Here is the list, in tabulated form:—

IN GOVERNMENT YARDS.	
Battleships	3
First-class cruisers	1
Second-class cruisers	0
Third-class cruisers	1
IN PRIVATE YARDS.	
Battleships	2
First-class cruisers	3
Second-class cruisers	3
Third-class cruisers	5
Torpedo-boat destroyers	28
	46

All these vessels are to be completed by 1899, as well as those already in hand, so that in addition to a number of new vessels, the shipbuilding programme is to be accelerated. It is also proposed to re-arm some of the older vessels with quick-firing guns. Comparing this programme with our forecast of last month, it will be seen that in some respects it falls short of our estimate. But that estimate was not based on the assumption that we should complete the vessels in hand as quickly as is now proposed. It is to be gathered from the statements of the First Lord that he looks upon this scheme merely as an instalment, and that more ships must be added next year, with more men and guns, &c. Regarded in this light, the number of ships now proposed may be considered enough for the time only, especially if it be true that when all these vessels are in hand we shall actually be building up to the full resources of the country in peace time for the supply of armour, steel, and other materials. This is a factor which must be taken into consideration.

The Designs of the Ships.

The new battleships are designated "improved *Renowns*," which is to say that they are in their characteristics somewhere between the *Renown* and *Majestic*. The following are the principal particulars:—Length, 390 ft.; beam, 74 ft.; draught, 25 ft. 6 in.; displacement, 12,900 tons. Water-tube boilers will supply steam to engines of 15,000 I.H.P., giving a maximum speed of 18·5 knots. The coal capacity at legend-draught will be 900 tons. The armament will consist of four 12-in., twelve 6-in., and 30 smaller guns. The maximum armour on the citadel will be 6 in. of Harveyed steel, while that on gun positions will be 12 in. of the same material. The new battleships will therefore be 2,000 tons lighter than the *Majestic*, and will draw about 2 ft. less water. They will carry the same armament, and the protective arrangements will be the same, but with a less thickness of armour. The coal endurance will be the same, but they will have greater speed, and such benefits as will accrue from water-tube boilers they will also possess. In other words, protection and habitability have been given up, and in place of these qualities higher speed and less draught of water has been obtained. They will be able to overtake any other battleship afloat, and can, if necessary, go into distant seas; but as compared with foreign vessels of similar type they have very much less protection. The new cruisers are of similar design to some already laid down. The first-class cruisers will be like the *Diadem*, of 11,000 tons, the second-class cruisers like the *Talbot*, of 5,600 tons, and the third-class cruisers like the *Pelorus*, of 2,135 tons displacement. As regards numbers, it cannot be said that the proposals are excessive; while as regards design, it is to be remembered that no vessels of these designs have yet been tried, and critics, by no means hostile to the Government, have pointed out that they scarcely compare altogether favourably with some foreign vessels of similar type, either in armament, protection, or speed.

The Provision of Officers and Men.

The weak part of Mr. Goschen's scheme has been described as his provision for men. Here there is to be an increase of 4,900, which, considering that at least 10,000 are required for the new vessels alone, can scarcely be considered an adequate augmentation. The complements of the new vessels are as follows:—

5 Renowns (700 each) ..	3,500
4 Diadems (600 each) ..	2,400
3 Talbots (500 each)	1,500
6 Peloruses (200 each) ..	1,200
28 T.-B. Destroyers (50 each) ..	1,400
	10,000

The total number of officers, seamen, boys, marines, &c., for the year is 93,700, but it is well known that we cannot do with less than 100,000, so that we are still left with a deficiency of 6,300, and with an additional number of ships next year, it will be greater still. The increase this year is to consist of 61 commissioned officers, 30 subordinate officers, eight warrant officers, 1,800 seamen class, 342 artizans, 2,028 engine-room ratings, 131 miscellaneous ratings, and 500 Royal Marines. In the discussion on this point, which, since the introduction of the Estimates, has taken place in the House, Mr. Goschen announced that "he could man every ship that could be ready to-morrow with the men we have now, drawing only 5,000 from the Naval Reserve. If we were to send every possible ship to sea which is seaworthy, excluding harbour ships, we could man the whole of them (though it is impossible to suppose they could all be ready at once) by taking a draft of 11,000 men from the Naval Reserve." As the nominal value of the Reserve is only 24,000 men, and it is doubtful if we could get one-third of them, this announcement is tantamount to an acknowledgment that we have no Reserve at all, for it means that we should have to use up our Reserve to man the available fleet, and should have nothing left to meet the waste of war.

The Entry and Training of Naval Cadets.

In connection with the subject of the provision of the *personnel* for the Naval service some radical changes are proposed in regard to the supply of executive officers. It is intended to raise the age at which boys are admitted to the service for this branch of the naval profession from 13½ to 14½, as it is at present, to 14½ to 15½. It is also intended to alter the system of education in the *Britannia* and to substitute for that vessel a college on shore. These proposals have given rise to considerable controversy, and the columns of the *Times* have contained numerous letters on the subject. The reason for raising the age for admission is, according to the official view, a desire to widen the field from which boys are obtained, in a scholastic sense. That is to say, it is hoped that by giving an additional year the public schools will be able to enter the competition. From the letters and discussion which has resulted it seems highly probable that the change will have a directly contrary effect, and will tend to throw the supply more than ever into the hands of those schoolmasters who lay themselves out entirely, or nearly so, for this work of preparing naval candidates. Moreover, it is held to be altogether unfair for the naval authorities to attempt to give a preference to any class of school. The change in the curriculum of study in the training establishment follows naturally upon raising the age, for, as the boys are presumed to come to the *Britannia* better grounded in general knowledge, the course of study in that establishment will become more specialised, and a less extended course will be adopted. It is, however, in regard to the substitution of a college for a ship that the controversy rages most fervently. Some writers of authority are distinctly against this change, and hold that so long as we wish our officers to be seamen they should be educated in a ship, while others, and these the greater numbers, assert that if a college is desirable at least it should not remain in the neighbourhood of Dartmouth, which is far from being satisfactory from a hygienic point of view, and, moreover, does not afford any proper facilities for teaching boat sailing. It is quite possible that in face of the opposition which has been created these proposals may remain in abeyance for another year.

The Naval Works Bill.

The provision of ships and men is necessarily supplemented by permanent works. New docks are to be provided and new plant in the Government establishments. Barracks are to be substituted for hulks, and the defences of the anchorages for the Fleet are to be overhauled and looked to. The Bill for these purposes provides for an increased expenditure of £2,750,000 beyond the £1,000,000 which was voted for similar work in a Bill last year. Of this sum of three millions, seven hundred and fifty thousand pounds, a considerable amount is due to revised estimates for work already sanctioned. Thus at Keyham there is a very large additional expenditure contemplated, and at Hong Kong also. The total sum of £2,750,000 to be provided for in the additionel estimate is made up as follows:—Enclosure and defence of harbour at Gibraltar, £300,000; at Portland, £200,000; at Dover, £150,000; for deepening harbours and the approaches to them, £300,000; for Keyham Dockyard, including £175,000 for fixed machinery, £500,000; Portsmouth Dockyard, £74,000; the extension of Gibraltar Dockyard, including £63,000 for fixed machinery, £300,000; the dockyard extension at Hong Kong, including for fixed machinery £20,000, £80,000; Naval Barracks at Chatham, £200,000; Portsmouth Naval Barracks, £150,000; Keyham Naval Barracks, £50,000; Naval Hospital at Chatham, £100,000; Walmer Marine Depôt, £5,000; the Engineers' College at Keyham, £25,000; College for Naval Cadets, £60,000; various magazines, including £25,000 for fixed machinery, £150,000; and five per cent. on the estimates for miscellaneous charges and superintendence, £106,000. Most of these items it is obvious are not such as to admit of much discussion. It is an acknowledged fact that they have been needed for a long time, and it has been only the culpable neglect of various and successive Governments that have prevented them from being supplied long ago. There are, however, one or two matters which will need further explanation and which will not be allowed to pass without question, notably the docks at Gibraltar and at some other places.

Naval Administration.

The most important book of the month, from a naval point of view, is the volume dealing with the above-named subject, written by Sir Vesey Hamilton, late First Sea Lord of the Admiralty, and published by Messrs. Geo. Bell & Sons. Until this work was issued there was not, in the whole range of naval literature, a book to which students could go in order to learn how our fleet is provided, governed and managed. A deep debt of gratitude is therefore due to Sir Vesey Hamilton for the issue of this dispassionate description of this most important office and its method of working. Its permanent value must be very great, and at the present time, when the system of administration is assailed by many critics, including Lord Charles Beresford, who has recently taken up his parable at Birmingham, it should be in the hands of every publicist, and all who take an interest in the affairs of the country. The purpose of the volume is to describe the present character and operations of the Admiralty Board, as the organising force behind our Sea Power, shaping and broadly directing that maratime arm which is our national safeguard. The historical evolution and constitutional positions of the Board of Admiralty are dealt with, and it is shown how that Board and its departments have been developed to meet the modern needs of the Empire and the fleet. The system and "machinery" by means of which the fleet is created and sustained, by which it is supplied with officers and men, distributed throughout the world, and supplied with everything necessary for the exercise of its functions in peace and war, are laid before the reader. He is told upon a basis of history, what are the organisations and duties of the Civil departments, which are the Admiralty "machinery." Finally, the Board and the "machinery" are shown at work, in a series of chapters devoted to an account of the actual conduct of the naval business of the country. In the course of this inquiry, a host of interesting matters are dealt with, such as the question of Admiralty responsibility, the formulation of shipbuilding programme, responsibility for design, and construction of ships, contracts, and the conditions of financial supervision and control. The book belongs to a series of "Royal Navy handbooks," of which the second number by Fleet Engineer R. C. Oldknow, on "The Mechanism of Men of War," has also been issued, and is a most popular exposition of the subject.

Portsmouth Dockyard.

That the work in this yard allotted in the Estimates is not inconsiderable cannot be truthfully said, although it is less in amount than is to be given elsewhere. The north wall jetty is at last to be completed, and will be a grand improvement. A new boiler shop and the electrical works will also be of material benefit to the yard, and the former will enable Portsmouth to emulate her sisters in turning work for the ships in this direction. Meanwhile there is ample opportunity for a display of energy in the programme which has been laid out for the next twelvemonth. The *Eclipse* cruiser is to be ready to hoist the pennant in June next, and the *Prince George* battleship in the October following. These two vessels will probably be on the overtime list for a while, if it does not become chronic with them. There are also plenty of signs of the renewed activity on the construction of the *Gladiator*, and in the workshops where the material for this vessel is being prepared, it is all the workmen can do to keep pace with those who are building it into the hull of the cruiser. When the new battleship will be begun is as yet uncertain, but it is rumoured here that the order for her material was given to the contractors before the Estimates were published, and that it will begin to arrive before long. One notable circumstance must be remembered in connection with this yard—the new docks will be ready for the reception of the first-class cruisers, *Powerful* and *Terrible*, by the time these vessels are ready to go into them. The mild winter is responsible for this most interesting fact, for it enabled the contractors to get on so much quicker with their work, that it is now anticipated that both docks will be ready for use six months in advance of the contract date. The incidental work of the yard during the past month has included the commissioning of a new flagship, the *Impérieuse*, for the Pacific, and the despatch of the *Grafton* with a relief crew to the *Collingwood*.

Engineer Officers and the Estimates.

The statement of Mr. Goschen, so far as it related to the engineering branch, has not given that amount of satisfaction to this deserving and useful corps which some previous special admissions had led it to expect. The First Lord of the Admiralty stated that "the list of engineer officers will be raised from 200 to 300. A new scale of pay has been fixed for engineer officers by an Order of Council of July 4th, 1895, with a view to placing the higher ranks more on an equality with the senior officers of the civil branches of the Navy, and in order to promote adequate remuneration for their increasingly arduous and responsible services." There are now on the list of the Royal Navy slightly more than 750 engineer officers of all grades, and it is assumed from what Mr. Goschen said that it is intended gradually to bring the numbers up to 850. Well-informed persons, however, affirm that no less a number than 1,000 engineer officers are required for the ordinary peace requirements of the service, and they hold, therefore, that at present there are no signs of that amelioration of their condition for which the engineers have been so long agitating. On the other hand, although it is generally acknowledged that some improvement has been made in the matter of pay, this improvement, it is alleged, does not go far enough to prove an adequate inducement to the right kind of men to join the Navy in the engineers' department. The matter is to be brought before the House of Commons, when doubtless further light will be thrown on Mr. Goschen's somewhat enigmatical utterances.

Chatham Dockyard.

At this yard everyone is satisfied with the share of new construction which it will obtain in the new scheme. A new battleship is, it is true, all that will be laid down; but this, with the work in hand, will provide plenty to do for the establishment. The battleship *Victorious* is to be completed, and vessels of this size in their last stages always employ a large number of hands. The *Illustrious* battleship is also to be pushed on, so that before the end of the year we may expect to be at work on three of the largest-sized vessels. Then the *Minerva* cruiser is to be completed this financial year, and the *Vindictive*, which vessel has not as yet made such rapid progress as at one time was anticipated, will be pushed on with the customary energy of the yard. Among the new works which will be begun is a hospital for the accommodation of 600 invalids, which will probably be erected on St. Mary's Island to the east of the extension works, and near the site chosen for the new barracks, on which a commencement is also to be made. What has been long a want here, a torpedo store, is to be supplied, adequate for the needs of this important depot. The completion of the *Victorious* will not be delayed, in consequence of her machinery being unfinished: Messrs. Hawthorn, Leslie & Co. have got the main engines in place for some time, the boilers on board and the funnels *in situ*, so that the ship should be ready for her steam trials by the end of April. The repairs to the *Monarch* and *Northampton* are complete, and these vessels are out of hand. It is a great pity that the *Monarch* was not fitted with a modern set of guns, for in that case the re-fit might indeed have been called complete; but it is anticipated at this yard that the remonstrances of Lord Charles Beresford on this head, now that he is free to comment publicly on the matter, will at last have effect.

Man-of-War Launches.

Two of the new second-class cruisers of the *Venus* type, nine of which are in hand, have taken the water during the past month. The *Doris* was successfully launched from the yard of the Naval Construction and Armaments Co. at Barrow, on Tuesday, March 10th, and received her name with the usual ceremony from the Hon. Fanny S. Hood, a daughter of Lord Hood of Avalon. The *Dido* was launched in the Clyde, but only after some delay, not unattended with danger to the ship. The *Mars* battleship, will, before this journal is in the hands of its readers, have been floated out of dock, at Messrs. Laird's of Birkenhead.

Devonport and Keyham.

Among other improvements contemplated at these yards is the widening of No. 2 Dock at Devonport. This dock is about 430 ft. long and therefore the longest in the yard, but it is not so wide as No. 3, in which is the *Renown*. No. 2 will now be made capable of taking the largest class of battleship. In other respects the West Country establishments have no reason to complain of their portion of the work in the Estimates. To build a battleship has always been the aspiration of the Devon officials, and now at last they have got their wish. She will be laid down on No. 3 building slip as soon as the *Arrogant* cruiser is out of the way and the necessary alterations are effected. It is as yet uncertain whether the engines and boilers of 15,000 I.H.P. for this battleship will be built at Keyham or by private contract. The *Arrogant* is to be completed this year, and the *Furious*, her sister ship, is to be pushed on to a considerable extent. The battleship *Renown* will be completed in June next, but the *Talbot* cruiser ought to be ready a month earlier. At Keyham the machinery for the third-class cruiser *Proserpine*, building at Sheerness, is the more important item. The following vessels are also to be refitted here, *Aurora*, *Amphion*, *Edgar*, *Magicienne*, *Salamander*, and *Sheldrake*. The *Hyacinth*, which has arrived home to pay off, will go into the dockyard reserve, and will not, in all probability, see any more service unless as a vessel for training purposes. An immense amount of little work in the shape of repairs has been caused by the troubles of the torpedo-boat destroyers, both of the educational flotilla and of those attached to the Channel and Particular Service squadrons. The Admiralty, recognising that these vessels need constant attention, are about to have spare boats allotted, so that as a vessel comes in for repair and overhaul her crew can turn over to another and go on with their course of training.

Sheerness Dockyard.

The chief item of work at this yard continues to be the *Pelorus*, although the length of overtime in her completion has now been somewhat reduced. A large amount of work remains to be done to her before she is ready for trial, and it must be remembered that June is to see her ready for the pennant, according to the programme. The *Cleopatra* is nearly finished and should have been out of hand on April 1st, were it not that other matters have compelled delay; as it is, she should be cleared off in a few weeks more. The *Wrangler* is here also preparing to pay off, and be disposed off, her crew having already turned over to their new ship. What will be done with the old *Castor* is still uncertain, but she is in the basin along with one of the coastguard cruisers and a couple of torpedo-boat destroyers. The *Caroline*, another ship lately returned from foreign service, will, like the *Garnet*, go into the Reserve, but what the future fate of these obsolete craft will be is still undecided.

Naval Contracts and Contractors.

The First Lord of the Admiralty has, during the month past received a deputation of Members of Parliament and others representing constituencies on the Thames and Thames industries, who desired to place before him, in his official capacity, the desirability of placing in the London district a portion of the Government Naval contracts. It was urged by several influential members of the deputation that the necessarily high rates of wages paid in the Thames works should be taken into consideration in dealing with this matter. Mr. Goschen, in replying to the deputation, went very fully into this interesting and important question, which so deeply affects the shipbuilding and engineering industries; but while expressing his sympathy with the East End of London, and his desire to place contracts there, he said that the question bristled with administrative and political difficulties. Could he, he asked, require the country to pay more for ships in order to keep up the standard of wages in London? The question is one, indeed, for the serious consideration of the shipbuilders of London and their employés, for there can be no doubt that unless something is done, the decadence of the industry will continue, and prosperity will for ever forsake this important work on the banks of the Thames. Mr. Goschen suggested that it would be wise on the part of the men to reduce their demands and to take a lower scale of wages, in order that the shipbuilders might stand a better chance of getting work. He also pointed out that if the Government began to consider differential rates of wages in tenders for ships, the same system would have to be adopted in regard to materials, coals, and other stores.

Pembroke Dockyard.

Preparations for the launch of the first-class battleship *Hannibal* are being pushed on at this yard, and it is evident that the Naval authorities are desirous of showing that the record of the *Renown* is not the standard by which we are to be judged. We are rather disappointed at the extent to which this yard is dealt with in the Estimates, particularly when such a large expenditure is undertaken in connection with the Works Bill, and the matter of an extension of the existing dock to modern requirements will certainly be made the subject of discussion in the House of Commons. It was considered to be a promise on the part of the late Government that a jetty should be built here, but it had become known that the Admiralty, on re-consideration, did not approve of this matter. But to make the yard adequate for fitting-out purposes, a larger dock is absolutely necessary, and this it was hoped the Board would urge, and the present Government see fit to grant. The *Hannibal* is to be completed at Portsmouth, for which yard she will leave here next January; but the *Andromeda*, which will be launched in the same month, might have been allowed to remain until finished if some changes as suggested had been made.

NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from February 24th, 1896, to March, 24th, 1896:—

Amor, Edward R., R.N., assistant engineer, has been awarded by the Admiralty the Newman Memorial Prize for 1895, for obtaining the highest marks in the professional papers of that year.

Armstrong, J., chief engineer, has been advanced to the rank of staff engineer in Her Majesty's fleet.

Atkins, A. E., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Baron, R., assistant engineer, has been promoted to the rank of acting engineer in Her Majesty's fleet.

Bench, G. E., chief engineer, has been advanced to the rank of staff engineer in Her Majesty's fleet.

Bennington, John W., fleet engineer to the *Pembroke*, to date February 22nd.

Black, William J., chief engineer to the *Racoon*, to date March 2nd.

Brown, Walter, chief engineer to the *Vivid*, for the *Shannon*, undated.

Burnett, William C., chief engineer to the *Pembroke*, additional for the *Pelorus*, to date February 24th.

Campbell, E. J., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Cleave, Richard C., assistant engineer, to the *Impérieuse*, undated.

Dathan, W. A., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Davis, Frederick C., engineer, to the *Imperieuse*, to date March 5th.

Dewhurst, Charles, assistant engineer to the *Mersey*, additional for the *Circe*, to date March 3rd.

Duffell, W. J., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Everitt, Alfred E., assistant engineer, to the *Imperieuse*, to date March 5th.

Fraser, George J., fleet engineer to the *Collingwood*, undated.

George, Francis T., chief engineer to the *Pembroke*, additional for the *Diana*, to date March 2nd.

Gorfett, George J., chief engineer to the *Racoon*, to date February 22nd.

Hale, William B., assistant engineer to the *Imperieuse*, to date March 5th.

Hammond, Hilgrove (probationary), assistant engineer to the *Imperieuse*, to date March 11th.

Hart, Alfred, chief engineer to the *Surprise*, to date March 2nd.

Heyes, H. W., assistant engineer, has been promoted to be acting engineer in Her Majesty's fleet.

Heyes, Henry W., acting engineer to the *Wallaroo*, to date December 23rd, 1895.

Hill, Walter S., assistant engineer to the *Collingwood*, undated.

Hockey Stephen, chief engineer to the *Sphinx*, undated.

Holgate, George S., engineer to the *Northampton*, to date March 2nd.

Huddy, John B., assistant engineer to the *Warspite*, to date March 5th.

Hyde, Thomas B., staff engineer to the *Imperieuse*, to date March 5th.

Jeffery, George H., assistant engineer to the *Northampton*, to date March 2nd.

Kingsnorth, Arthur F., engineer to the *Mersey*, additional for the *Circe*, to date March 3rd.

Lane, J., chief engineer, has been advanced to the rank of staff engineer in Her Majesty's fleet.

Lawrance, William W., engineer to the *Wildfire*, additional for the *Dragon*, to date March 2nd.

Mallinson, E. D., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Melrose, J., inspector of machinery, to be chief inspector of machinery in Her Majesty's fleet.

Michell, J. L., chief engineer, has been advanced to the rank of staff engineer in Her Majesty's fleet.

Mitchell, W. F., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Moorshead, J. E., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Norgate, Robert S. G., chief engineer to the *Victory*, for the *Nymphe*, to date April 3rd.

Olive, W., fleet engineer, to be inspector of machinery in Her Majesty's fleet.

Page, Gilbert H., assistant engineer to the *Blake*, to date February 24th.

Peacock, David, engineer to the *Victory*, additional for gunboats at Haslar, to date March 2nd.

Pounds, Thomas H., engineer to the *Vivid*, additional for the *Virago*, to date March 25th.

Raper, R. St. J., engineer to the *Skate*, to date March 14th.

Read, A. T. P., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Roberts, Ivor E. S., assistant engineer to the *Collingwood*, undated.

Stevens, John G., chief engineer to the *Victory*, additional for the *Nelson*, to date March 23rd.

Stewart, W. H. W., engineer to the *Opossum*, undated.

Sugrue, Jeremiah, M.D., staff engineer to the *Buzzard*, to date February 26th.

Teed, Henry R., engineer to the *Pembroke*, additional for the *Jaseur*, to date March 23rd.

Thompson, Frank D., engineer to the *Pembroke*, additional for the *Spitfire*, to date March 2nd.

Thornhill, Ernest C., engineer to the *Redbreast*, to date March 23rd.

Townsend, W. E., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Tricker, Elijah, fleet engineer to the *Victory*, additional for the *Mercury*, to date March 21st

Vibert, John E., engineer to the *Collingwood*, additional for appointment when recommissioned, to date February 24th.

Ward, John T. H., engineer to the *Hibernia*, additional for the *Sandfly*, to date March 2nd.

Willby, R. G., staff engineer, has been advanced to the ran fleet engineer in Her Majesty's fleet.

Woolbridge, George W., assistant engineer to the *Collingw* undated.

HOAR & BROWN'S HARDWOOD MARKET REPORT, MARCH 21st, 1896.

Teak.—	Timber. Loads.	Planks. Loads.	Blocks. Loads.	Total. Loads.
Stock, 1st Mar.	8,922	2,737	81	11,740
Landings	1	265	—	266
	8,923	3,002	81	12,006
Deliveries	528	217	*nil*	745
Stock, 20th Mar.	8,395	2,785	81	11,261

The market has become very firm, and a decided rise in values has taken place. At the present moment buyers are unable to obtain quotations from abroad for shipments in quantities. This feature has enabled holders of landed stocks to command an increased profit upon standing quotations of a few months back, and business has consequently become fairly brisk. The contemplated orders for the building of vessels for the German Government, together with further selections about to be made by H.M. Government, will tend to still further augment prices.

A very good demand has been shown for planks of all sizes, in spite of the market being hard pressed at public sale with the usual "without reserve" qualities. Deliveries have been good, and a fair business may be anticipated.

MAHOGANY. TOBASCO.—The small supplies have led to a rapid advance in values, the minimum during the last few months having more than doubled itself. For this class there has been a good demand generally, but large wood has not shown so much activity. Prices fluctuated during the year, and some of the later public sales showed a decided falling off in the demand.

The stock of Honduras wood is light, and further supplies are not expected until May.

Cuba is being sold at much advanced figures. Although the minimum (which includes the undersized and crooked wood) remains low, a marked advance in values immediately presents itself outside this category. Prime 16 to 18 in. squares are particularly in demand, and heavy prices are being paid for such parcels. The cheap stocks of Mexican, Panama and Tecolutla are mostly cleared off, and the minimum of other classes will be materially assisted by this.

Cedar.—There has been little offered lately, and the market has become very bare. A cargo of Paraguay has arrived which will compete favourably with the genuine article. Substitutes are invariably found when prices get beyond reach of the ordinary purchaser.

Walnut Logs have risen to an almost prohibitive price. Many shipments have found buyers, but considering the quantities behind there is risk in purchasing at these advanced rates.

Kawrie Pine.—Considerable quantities have been placed during the last fortnight, and first hand stocks are very small, consequently prices are becoming firmer.

Sequoia.—While mahogany is ruling so high this wood has come especially into notice, among the cabinet and other trades, and being low in price commands considerable attention.

Rosewood.—Stocks are small, but the demand is light, and values have not further increased.

Whitewood.—Business has been very active at prices remunerative to the shippers.

Greenheart.—A small stock appears sufficient for the London trade; and business is very quiet at ordinary prices.

Generally speaking the trade is in a sound and satisfactory condition, and special advantages appear to have fallen to the lot of the dealers, who have been slow to benefit by them.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(*From our own Correspondent.*)

THE industrial position in Glasgow and the West of Scotland continues most satisfactory, but has not developed many new features during the month. It is satisfactory to note that the numerous trade disputes have either been fixed up for a time or are in a fair way of settlement. While the volume all over has been large, still, makers of iron and steel goods are not yet reaping the full benefit of the late advances as contracts running were fixed at the low rates of January. The specifications for the British naval work will be out within the next few days, but Clyde hopes are less bright, as the Tyne builders of late have been seriously underbidding Clyde firms, and unless the Lords of the Admiralty, wishful of a speedy yet thorough job, decides to spread over the work, the chances are decidedly in favour of the North of England firms. This belief has reflected in the iron and copper markets, although statistically the latter metal should stand at a higher level. All the shipbuilding yards on the Clyde continue to be well employed, and during the month several very important orders have been placed. It is calculated that Messrs. Thomson, at Clydebank, have between 30,000 and 40,000 tons of shipping in hand, including no fewer than nine war vessels for the British Admiralty; Messrs. Caird & Co. have 24,000 tons of shipping in hand; Messrs. Scott & Co. have about 12,000 tons of work on hand; Messrs. Chas. Connell & Co. have over 40,000 tons; Fairfield have not less than 30,000 tons; Messrs. D. & W. Henderson should have about 30,000 tons; and the London and Glasgow and Messrs. Robert Napier & Sons must have about 20,000 tons each on hand.

It has been known for some time back that orders have been in the market for a large fleet of powerful cargo-carrying steamers to trade between this country, China and Japan, but especially with the last-named. Much interest was felt as to the placing of the work, and it now appears that two firms on the Partick side of the river have each received orders for two of the steamers, and that other four have gone to Belfast builders. The eight steamers will be of 6,000 tons each, and will absorb 24,000 tons of steel. The company are building a ninth steamer in Japan of 8,000 tons, also for cargo-carrying purposes, and the steel is being provided by the Steel Co. of Scotland.

The proposed new Government graving dock at Greenock is receiving very lukewarm support from the Government authorities, and this fact is received with much satisfaction from shipbuilders on the Clyde. Clyde builders contend that while such a dock would be advantageous in time of war, it would in the long run do harm to Clyde shipbuilding, for were the dock granted, a Government staff would be necessary, and as Government employees receive a higher rate of wages than rules in private yards, difficulties would occur, and trade would thereby be driven to other centres.

The loss of the five third-class cruisers of the *Pelorus* type to the Clyde has occasioned considerable disappointment in this district. The prices accepted for the vessels have certainly surprised builders on the Clyde, and their explanation of the difference, and a reasonable one too, is that the English firms have not a full knowledge of the little changes in detail which add materially to the cost of production and which cannot be included in the specification. They are therefore included in that comprehensive term, "Admiralty practice," which has been such a source of difficulty. Only constant study can bring accurate knowledge of the continual change in this practice, and it is the want of it which often results in lower tenders being submitted than are expected. The Clyde firms do not repine, however, there is plenty of other naval work in prospect, and as Clyde builders have had experience with exactly similar ships, they will no doubt be well able to give a fair quotation for the bigger cruisers and battleships.

Messrs. The London and Glasgow Engineering Co., Limited, booked an order about mid-month for a steamer of 4,000 tons for an Eastern shipping company. In connection with the launch of H.M. cruiser *Dido*, by above firm of builders, it is worth recalling that one of the rules in connection with Government work done by private firms is that all "launching arrangements" must be inspected and passed as satisfactory by a Government inspector before vessels are launched; if a yard manager fixes up the launching arrangement of a Government vessel in the way he thinks best for the vessel's safety, and he is not interfered with in any way, he and he alone is responsible for what may happen. But if, after he has finished, a Government inspector comes along and suggests or compels certain alterations and anything happens, it would be unjust to the yard manager in that case to make him bear the burden of any mishap that may take place. This is a point which must not be forgotten when the time comes for considering the case of the unfortunate *Dido*. It is also worthy of mention that the *Dido* was insured for fitting, launching, and trial trips at 2s. 6d. per cent. The insurances were effected, for the most part in London, only one or two local firms having accepted a share. The fact is, locally these risks are not taken, as the premiums are so low, and as one claim sweeps away more than all the profits. The London writers were evidently much exercised over the *Dido* mishap, and on the day after launching the rumour was current in the South that a full claim was certain. Happily, that has proved an exaggeration. At the same time, the mishap may lead to a hardening of rates for future risks.

The sixth annual meeting of A. & J. Stewart and Clydesdale, Limited, was held in the Accountant's Hall, Glasgow, on the 23rd ult. Mr. Andrew Stewart, who presided, in moving the adoption of the report, expressed his gladness that the improvement which he had predicted had taken place in all branches of their undertaking, and more particularly during the past six months. The directors recommended that the following dividends be paid, viz.:—At the rate of six per cent. per annum on the preference shares, at the rate of nine per cent. on the ordinary shares, and placing £10,000 to reserve fund, £10,000 to depreciation fund, and carrying forward £8,915 1s. 4d. At this time last year the dividend on the ordinary shares was 3½ per cent., after placing £10,000 to depreciation and carrying forward £4,491. Messrs. Stewart and Clydesdale will soon be able to manufacture solid drawn tubes, which are now much inquired after for water-tube boilers, preparations for their manufacture now nearing completion. The demands for these tubes are so great that present manufacturers are unable to cope with them.

The Steel Co. of Scotland were successful during the month in having secured the contract for 12 months' supply of steel angle bars for Government dockyard shipbuilding purposes. On one day during the month this company had a record output—160 tons of plates being rolled in one shift of 12 hours. This has been beaten by Messrs. Colville & C Motherwell, but at the same time it must rank as a capital performance. The Steel Co. at both the Blochairn and Newton Works is very busy, and a visit to the Coatbridge district shows a similar state of things. It is pleasing to note that the manufactured iron and steel orders are well distributed, and full prices are asked. Indeed, it is no secret that so soon as present contracts run off, a further hardening in prices will follow. As it is Messrs. Colville & Co. announced that ship plates are 2s. 6d. per ton up to £5 7s. 6d., steel bars 5s. at £6 10s., and steel angles about 2s. 6d. at £5.

Labour disputes are not yet at an end, several of the large engineering shops on the Clyde being still at daggers drawn with their masters. In one shop the men came out a fortnight ago, and unless some speedy settlement is made others may follow. The men contend that the employers, by dismissing certain workmen and refusing to give pay lines, are not implementing the terms of arrangement for the reinstating of all hands as drawn up by Lord James and the Lord Provost when the lock-out terminated. The masters, on the other hand, maintain that they are determined to have some say in the conducting of their business. By some of the officials there are doubts that there will be a spread of the troubles before all are again at work. Every effort to avoid such a misfortune is, however, being made by the executive of the A.S.E. in London.

It was officially announced at a meeting of the Board of Conciliation and Arbitration for the manufactured steel trades of the West of Scotland, held in Glasgow during the month, Dr. Dyer, the vice-president, in the chair, that it was agreed to grant to the men connected with the Board an advance of wages at the rate of 5 per cent.

The by no means overcrowded ranks of yacht designers on the Clyde have received a worthy recruit just now in the person of Mr. William Jardine, jun., Dumbarton. At the recent exhibition and competition of models in the Metropolis, held under the auspices of the London Sailing Club, a model of his was very favourably spoken of, and early in the month Mr. A. W. Steven, Helensburgh, commissioned Messrs. Paul Jones & Co., Gourock, to build a first-class 17 by 19 ft. racing boat from plans by Mr. Jardine.

It has been known for some time that Messrs. D. & W. Henderson & Co., Meadowside, had on hand a large racing yacht, from designs by Mr. G. L. Watson. The circumstances has aroused much interest in yachting circles, which have been considerably exercised to discover the ownership of the yacht. It now transpires that the racer is being built for Sir George Newnes, with whose name rumour was busy towards the end of last year as a possible challenger for the American Cup It is believed that it is Sir George's intention to challenge with his Clyde built racer.

Messrs. J. & G. Thomson, Clydebank, are steadily progressing with the machinery of the *Pelorus*, and although this firm were kept very much behind on account of the recent engineers' strike, they are hopeful of delivering H M.S. *Terrible* before the contract time, January, 1897.

Messrs. Caird & Co., shipbuilders, Greenock, have now, it appears, lost the monopoly so far as the supplying the wants of the P. & O. Co. is concerned. Orders have been placed for new tonnage on the Tyne and at Belfast, and this has occasioned considerable surprise, as Messrs. Caird have built all their boats until now and their work has always been up to the very highest standard of excellence.

Messrs. Gourlay, Brothers & Co., Dundee, contracted with Messrs. James Rankine & Son, of Glasgow, to build a screw steamer for their Grangemouth and Rotterdam service, to replace the steamer *Dundee*. The new vessel is to be of large power, with special accommodation for the Continental passenger trade, and she will be built to the highest classification of the British Corporation Registry.

Messrs. Archibald M'Millan & Son, Limited, Dumbarton, contracted about mid-month to build a sailing ship for Liverpool owners.

Messrs. Wm. Simons & Co., Limited, Renfrew, received an order, in the early part of the month, from the Mersey Docks and Harbour Board, for the construction of a large and powerful stationary barge-loading dredger, similar to the *Walter Glynn* recently constructed, this being the eighth dredging vessel ordered from Wm. Simons & Co. by the abovementioned Harbour Board.

The steam yachts *Hebe* (Mr. Coats) and *Wolverine* (Mr. Ackroyd) were taken into the graving dock of Messrs. Scott & Co., Greenock, during the month for an overhaul, the former also to be fitted with two new masts. The steamer *Greatham*, which arrived from Londonderry, will also have her hull cleaned in the same dock before going to Glasgow to load.

The Ailsa Shipbuilding Co., Troon, contracted late in the month for a new screw steamer, 275 ft. long by 36 ft. beam by 17 ft. 6 in. moulded depth, for the British and Irish Steam Packet Co., Limited, of Dublin, for their passenger and cargo trade between Dublin and London. She will be similar to, but somewhat larger than the steamer *Lady Hudson-Kinahan*, built by the same firm for the company a few years ago.

TRADE NOTES FROM THE TYNE, WEAR TEES, HARTLEPOOLS, &c.

(From our own Correspondent.)

THE TYNE.

Shipbuilding.—The new naval programme has given an important fillip to the industry of steel manufacture, and also to shipbuilding throughout the kingdom. There is, as was to be expected, some grumbling among a certain section of the public; but their protests and complaints are little heeded, and there is abundant evidence to show that with the mass of the people the project of the Government with regard to the further strengthening of the fleet, is immensely popular. The placing of two of the new cruisers with the Palmer Co., and one with the Elswick firm (Messrs. Armstrong, Mitchell & Co.), is a notable event for the Tyne, and will greatly help to stimulate business throughout the district during the next fifteen months.

The Admiralty additions to local work contracts are, however, not likely to be confined to the three cruisers; for there is the machinery required to equip the vessels about to be built in the Government yards, to be apportioned among private firms, and it will be strange indeed if part is not secured by Messrs. Hawthorn, Leslie & Co. There is, in addition, the 20 torpedo-destroyers to be allotted, and it seems reasonable to suppose that some of these also will be placed with builders on the Tyne.

The Palmer Co., are undoubtedly well provided with work, having no less than nine Government ships to build, besides the P. & O. boat of 8,500 tons carrying capacity, and another large vessel ordered more recently by the Steam Shipowners' Co., Liverpool. Simultaneously with the advent of the new management at this establishment an era of prosperity seems to have dawned, and it is gratifying to find that both as regards the quantity of work in hand and the reputation for quality in respect of work turned out the company now occupy a position to be envied. To receive repeat orders from the P. & O. Co., and from the Admiralty, is no slight distinction, and this in itself affords a guarantee that the company will safely keep the position of pre-eminence they have attained. The first of four Hamburg-American steamers which the company are building has been launched and is now at the sheerlegs receiving her machinery. The vessel, which has been named the *Asturian*, is as fine a specimen of the passenger-cargo steamer as could be met with anywhere.

Having secured an order for one of the third-class cruisers, offered to the competition of private builders by the Admiralty, Messrs. Armstrong, Mitchell & Co. have now warships in hand for no less than six Governments, namely, those of Japan, Chili, Brazil, Argentina, Norway, and the United Kingdom. They have also in hand a large railway ferry steamer and other work of a special character for Russia, besides two passenger boats for Finland, and several cargo vessels.

Messrs. C. S. Swan & Hunter have for some time past been engaged in completely remodelling the machinery throughout the various departments of their works, and have also been making such alterations in their older yard as were thought requisite to bring it quite up to modern requirements. They have put down new plate, bending rolls, and planing machines of the very best modern manufacture, capable of dealing with plates up to 26 ft. 6 in. in length, with punching and shearing machines of the newest types, and of greater capacity than those which were formerly employed. They have also provided an electric crane for each yard, by which plates can be conveniently and promptly "racked," and when required for working can be taken out and delivered to the platers, with the minimum of labour. Hydraulic cranes and lifts have been fitted to all rolls, as well as to countersinking, planing and punching machines, by which arrangement labour is again very greatly economized. Electric overhead cranes are employed for erecting and beaming vessels, and for lifting plates and other heavy weights into position. This, we believe, is the only shipbuilding yard in existence that possesses such an arrangement, and it may therefore be said with confidence that there is no other establishment that can set forth better claims to combining the possibilities of speed and economy in production. Among the other appliances lately provided with a view to make the equipment of the yards as perfect as possible, is a set of heavy plate straightening rolls. There are also two very effective "scarfing" machines, and a variety of other modern-type accessories, which it is unnecessary to particularize. In fact, nothing which can facilitate production, or which can contribute to produce accuracy and soundness in the structural details of ships, has been omitted, and it is no exaggeration to say that the firm, by their enterprise and forethought, are placing their great establishment—comprising two large yards—amongst the most complete and admirably equipped shipbuilding concerns in the world.

Messrs. Hawthorn, Leslie & Co. despatched from their yard, on the 18th inst., the torpedo destroyer *Ranger*—which is the third vessel of the kind built by them—for the purpose of delivering her to the authorities at Chatham. She made the run to the latter port in the unprecedentedly short time of 13 hours, and it is reported that on the passage the machinery—also constructed by Messrs. Hawthorn, Leslie & Co.—worked splendidly. As the two boats previously supplied went the journey in very bad weather, this latest run is significant as showing what the vessels can do when the meteorological conditions are favourable. The vessel will be at once completed for commission, and will be armed with six quick-firing guns and three torpedo tubes.

It is to be regretted that the large and well-equipped yards of of Messrs. R. Stephenson & Co., and Messrs. Edwards & Sons, are still without a vessel on the stocks, and this circumstance ought surely to moderate the exuberant optimism of those persons who are trying to make themselves and others believe that the long-looked-for "boom" in shipbuilding is come at last. These are not the only yards on the Tyne that show a "beggarly account" of empty berths, and it is safe to say that so long as there is any unappropriated building accommodation to be met with, the state of business cannot be described as having reached more than a partial measure of activity.

The Tyne Shipbuilding Co. continue to be well supplied with work, and at Messrs. Readhead's yard all the building berths are occupied, while in the repairing department business is active. Messrs. J. P. Rennoldson & Sons have just built for the Tees Conservancy Commissioners a large iron paddle steamer, which will be the most powerful tugboat yet possessed by that body, or indeed, by any other owner connected with the Tees.

Engineering.—An agitation for increased wages has been initiated by the officials of the Engineers' Society, and meetings with the employers' representatives have already been held in reference to the matter. It is probable that, for the sake of preserving amicable relations, the employers will offer to concede something, though it is well known that the state of trade and prices does not admit of an advance. The men may, of course, try to force matters; but if they succeed in compelling the masters to give more than they are inclined to give, they will be inflicting upon themselves a grievous injury. They may find this out when it is too late—that is to say, when the shops have again become empty through the masters having to decline orders, and they (the workmen) are again parading the streets in enforced idleness. A couple of years ago, the moulders made the huge mistake of going out on strike for higher wages, when there was no real pressure of work in the country. The lesson they were taught was a bitter one indeed; for after spending half the accumulated fund of their association (the savings of more than 80 years) they were obliged—such of them as room could be found for—to return to work on the same terms as they had before they came out. It is to be hoped that on the present occasion the engineers will keep this in mind, and not allow themselves to be led into a similar pitfall.

The marine engine works at St. Peter's, Jarrow and Low Walker, continue to be well employed, but at the Wallsend Slipway Works business has not yet reached that state of uniform briskness in the various departments that has characterised the establishment for some years past. The two marine engine establishments at Newcastle and Gateshead are extremely slack, and at most of the smaller works at these centres business is dull.

Owing to the greatly improved demand for steel plates used in boilermaking and shipbuilding, the plate mills at Newburn (Messrs. John Spencer & Sons) are now kept in busy operation. There is also a great increase of work in other departments, and appearances throughout the whole of the very extensive premises are favourable to the belief that a long term of prosperity has been entered upon. As a result of the better state of business, the value of the company's shares has risen considerably within the past few weeks.

Messrs. Emerson, Walker, & Thompson Bros., Limited, have just added to their works at Dunston a new forge, the equipment of which is specially adapted to the manufacture of small stern frames, and other forgings of the lighter class. They have also put down new plant in other departments, and have added to their productive facilities generally.

Messrs. Crosier, Stephens & Co., the Newcastle representatives of Messrs. George Richards & Co., Manchester, have, in addition to the "scarfing" machine for Messrs. Swan & Hunter, referred to elsewhere, received orders for a 20-in. side planer from a firm at Wallsend, and for a 12-in one for a firm at Sunderland. These machines are becoming very popular and are now in use at the works of the following local firms:—Armstrong, Mitchell & Co.; Black, Hawthorn & Co.; Clark, Chapman & Co.; Blair & Co.; Robert Thompson & Co.; Smith's Dock Co.; Wigham Richardson & Co., and others. They have also received an order from a well known Hartlepool engineering firm for two machines of very special type, namely, a 48-in. boring and turning machine, and a No. 2 Patent Pipe and Universal facing and boring machine. This latter machine is designed for facing and edging flanged pipes, elbows, bends, &c., and for facing and boring valve seats. By the attachment of a boring stay the machine can be used as a borer for cylinders and general work, and by fitting a slide rest, it can be used with advantage for turning and boring small flywheels and pulleys. By providing slots in the facing head, and arranging an automatic feed to the cross slide of the table, it becomes a valuable tool for facing pliant surfaces. This tool is rapidly coming into favour, and firms who are using it are finding it a very good investment indeed.

The boiler covering works of Mr. W. F. Snowdon, Side, Newcastle have been kept very busy lately, several important contracts having to be completed within a specified time. Among the contracts may be mentioned a high-class Russian Volunteer boat, which is the second vessel of this type, the boilers and steam-pipes of which were covered with Mr. Snowdon's composition during the present year. The reputation of this composition for its effectiveness as a non-conductor, as well as its economical and lasting qualities, is very high, and hence the sustained demand and consequent activity in its production.

Blyth.—The Blyth Shipbuilding Co. have just completed the conversion of the s.s. *Golden Fleece* from a cattle ship to a fruit-carrying steamer, and have also carried out alterations to the engines, resulting in increased speed and lessened coal consumption.

THE WEAR.

Shipbuilding.—On the plea that a scarcity of men existed, the supply not being equal to the demand, the shipwrights of the N.E. Coast have sought an advance of wages, and have been successful in obtaining the same. What we ventured to predict last month would be the case, in the event of this contingency happening, has come about, and various other sections of men who have no such excuse as the shipwrights to offer, are clamouring for advances. In the interests of peace, it is probable that the employers will find it expedient to make concessions to them. No one would grudge them a fair share of enhanced values, if they would only wait till the enhancement had taken place; but when they are asking for advances before the trade is strong enough to bear any appreciable rise in prices, it is impossible to regard their action with sympathetic feeling. The shipbuilders, no doubt, will be willing to risk something on the endeavour to satisfy these men, but it will be well for the latter to keep their expectations within small limits, as there is not much to draw upon.

In addition to having some half-dozen vessels of a special and most expensive class to build, Mr. Laing is now carrying out on a large vessel which has just been sold, extensive alterations to adapt her to the requirements of the cattle trade. This vessel is still on the stocks but it is expected that she will be launched shortly. A large hydraulic plate flanging machine by a Glasgow maker, has just been added to the varied and extensive plant of the Deptford yard, and for convenience of working has been placed in contiguity to the great plate-bending rolls that were put down some months ago.

Messrs. Short Bros., Messrs. Doxford, and Messrs. Priestman, are still busy, and it is rumoured that Messrs. Osborne &

Graham have booked an order for a vessel of large size. Messrs. Blumer & Co. have secured orders for a passenger-cargo steamer for Portugal, and for two cargo boats for English owners. Messrs. Austin & Son have also obtained orders for three steamers, the keel for one of which is now being laid, while frame-turning for another has been commenced.

The Sunderland Shipbuilding Co. have sold to Messrs. Jenkins & Co., London, the owners of the "Japan" line of steamers, a large vessel, which has stood some time on the stocks in a partially constructed state. The work of completing the vessel is being proceeded with, and it is expected that she will be launched next month. She will be fitted up similarly to the s.s. *Merionethshire*, supplied by the company to the same owners a couple of years ago. The vessel being intended for the passenger service to the East, will have a superior equipment.

At the North Sands yard there are now two berths vacant, but it is hoped that they will soon be filled up. From this establishment three exceptionally fine vessels were launched this year, *i.e.*, the two boats ordered by Messrs. Rickmers, of Bremen, each of which is capable of carrying 7,250 tons of cargo, and one for Messrs. Turner & Brightman, London, intended for the dead-meat trade.

Engineering.—Some improvement is noticeable at the North-Eastern Engineering Works, and also at Messrs. John Dickinson & Sons; but at Messrs. Doxford's and Messrs. Allan's considerable quietude prevails. The Southwick Engine Works are very actively employed, and at the Monk Street Foundry business is also brisk.

There is a fair amount of work in hand at the Sunderland Forge, and in the fitting shops attached some work of importance has just been carried out in connection with the equipment of ships built at the North Sands Yard.

The Hartlepools.—The Thompson Steam Shipping Co. have placed an order for one of three steamers they are about to have built with Messrs. Furness, Withy & Co. Both the yards of Sir W. Gray & Co. are well filled with work in progress, and the repairing department of the firm is also pretty busy. Engineering establishments are fairly well off for work, and both foundries and forges show signs of improving business. At the docks trade is dull, timber imports being as yet inconsiderable.

Stockton.—In the shipbuilding yards there is no change to note since last month; but we are pleased to learn that bridge building shops are becoming busier, and that new contracts are being booked. One firm, it is stated, has secured contracts for bridges, girders, and fire-proof warehouses, the material for which will amount to a total weight of something like 10,000 tons. In some engineering establishments night work is being resorted to, and in boiler-shops the pressure of work is much greater than at the opening of the year.

Middlesbro'.—At Messrs. Raylton, Dixon & Co.'s yard there has been a sectional strike, which, while it lasted, caused very great inconvenience. The firm are not members of the Employers' Association, and hence their subjection to exceptional treatment from the operatives. Messrs. Cragg & Sons have completed the removal of their business to new premises, wherein they will be able to build vessels of the very largest class. Steel works at this centre are still very busy.

THE MERSEY.

(*From our own Correspondent.*)

THE general prospects of trade are decidedly improving, and firms engaged upon the construction of all descriptions of marine engineering work are in this district mostly well engaged, considerable orders having been received recently both for home and foreign Governments and private firms. The shipbuilding industry is also in a satisfactory condition, at any rate, as regards the principal firms that are still engaged in this branch of industry.

Messrs. Laird Bros., of Birkenhead, are fairly busy with work in hand, principally on warships for home and foreign Governments. During the month, the *Capitan Munoz Gamero*—the second of four torpedo-boat destroyers on order for the Chilian Government, has been launched, these vessels, it may be added, having been ordered in August last, and H.M. torpedo-boat destroyer *Quail* underwent a second preliminary trial on the 14th March, attaining a speed of over 30 knots, or about 35 statute mile, per hour, which is a record, and assures her complete success. The firm is also making satisfactory progress with the other destroyers on order for the home and Chilian Governments whilst the battleship *Mars* will probably be floated in a few days. The *Banshee*, *Lynx*, and *Ferret* left the Mersey for Devonport on the 2nd March, in very boisterous weather, which, however, they underwent satisfactorily, the engines working splendidly, and the torpedo tubes and gun fittings showing no signs of weakness or vibration. Messrs. Laird are also busy in the construction of the four boats for the Government mail service between Kingstown and Holyhead, which are to be fitted out with the most recent improvements, and to steam at 23 knots per hour. The firm submitted an estimate for a still more costly type of vessel, but for economical reasons the offer was declined. We understand that there is no truth in the rumour that the German Government have ordered from Messrs. Laird a large number of warships.

In the general engineering trades continued increasing activity is reported generally. Machine tool makers report inquiries from all directions for every variety of light and heavy tools, one or two firms being very busy on orders for home and foreign Governments as well as for private firms engaged in supplying boilers and guns for the equipment of warships, and Messrs. Wm. Muir & Co., of Manchester, have secured some large orders for machine tools for the Ameer of Afghanistan's arsenal and workshops, and these tools have to be made in pieces not weighing above 3 cwt., and not more than 9 ft. in length, to meet the requirements of transit. Stationary engine builders continue well engaged, and machinists in many cases are full of work for some time to come. A considerable weight of new work is also being given out amongst boilers makers, and locomotive builders are booking further large orders, the Vulcan Foundry Co., of Newton-le-Willows, having in hand 14 heavy goods engines and tenders for the Indian Midland Railways, of a similar type to those previously supplied by the above company.

The usual monthly returns issued by the engineering trades unions are of a more satisfactory character as regards the number of members on the unemployed list than has been the case for five or six years past. The Amalgamated Society of Engineers has now only 3 per cent. of the total membership on donation, as against 5 per cent. last month, and in this immediate district the position is still better, only 2 per cent. of the local membership being now on the unemployed list, which is a lower percentage than has been recorded for a long time past. In the Steam Engine Makers' Society there are now only 1½ per cent. on donation benefit—a record which has scarcely been equalled since 1891, and the officials of the society are expecting a still further reduction of the out-of-work list in next month's returns. The reports from the different districts as to the state of trade are of a very encouraging nature, most departments being well employed, with some branches—especially heavy stationary engine builders—exceedingly busy. There is also a substantial improvement in most of the marine centres.

Messrs. Hulse & Co., Ordsal Works, Salford, are introducing a new band-sawing machine suitable for cutting webs out of large double cranks, cutting runner heads of large steel castings, and generally for heavy marine work. It is provided with feed motions which give a perfectly steady movement to the traversing saddles, and is throughout very strong and massive. The machine consists of a baseplate in T form, the upright of the T carrying the frame which supports the top pulley, over which the band saw passes, and the transverse part carrying the bed on which the articles to be cut are traversed. The lower pulley over which the band-saw passes is secured beneath the baseplate. The saw is kept in tension by a balance weight acting under a vertical sliding block which carries the top pulley. There are two beds on the transverse side of the baseplate, each carrying a traversing saddle, actuated together by twin screws, which are driven through change wheels on a swing frame, so that any desired traverse is obtainable. The firm have also designed a new universal horizontal boring, drilling, tapping, studding, and milling machine, which has a very powerful headstock, and which will drill and tap holes, and fit them with studs with great rapidity, the space commanded being 16 ft. long and 10 ft. high. Amongst work which the firm have in hand are complete plants for Belleville boiler work for Dockyards and private firms in England and abroad, including special screwing, cutting off, tapping, and facing machines for tubes and junction boxes, and hydraulic presses for staving the tubes, and they have also in progress massive armour-plate slotting machines, with universal adjustments for cutting at any required angle without disturbing the work. Other work in hand, for marine purposes, includes a large horizontal and vertical side planing machine, to plane a height of 6 ft., and a length of rather more, and a horizontal side planing and shaping machine, with an overhang of some 7 ft., which is the largest of its class that has ever been made, and these two machines have been specially designed for machining irregular shaped steel castings, such as stern frames and other large marine work of the above class. The firm are also engaged in the construction of a number of special machines suitable for gun work.

A handy saw-bench called the "Albion," which will be found a very useful adjunct on board ship, has just been brought out by Messrs. T. & R. Lees, of Hollinwood, near Oldham. This machine, which is worked by hand-power, has variable speeds for light and heavy jobs, and can be worked by one or two handles, according to the thickness of the sawing required. The table is 4 ft. by 2 ft., and has rising and falling steel spindle for rebating, grooving and turning, and a self-acting drag motion is provided for feeding the timber. The bearings are of gun-metal, and an adjustable canting fence and suitable boring apparatus are fitted to the machine. The bench is portable, so that it can be readily moved about from one part of the ship to another, and it is well adapted for shipment abroad, as it can be packed in one case. The machine can also be supplied in a form suitable for steam-power, if required. The firm have also an improved horizontal steam engine, which is particularly adapted for driving where varying loads have to be dealt with. The engine is fitted with a patent automatic cut off, under control of a high-speed governor, by which the valve is regulated with great precision, and supplies the steam according to the varying load, thus securing the greatest economy in steam and more uniformity in speed. The working parts are readily accessible, and the cylinders, which do not overhang, are full-sized, with long stroke, and work in double slides. The fly-wheels are turned on the face to receive the belt, and are of ample width and diameter. The pistons are fitted with a patent coil spring on the Mather and Platts' principle, and the glands are bushed with gun-metal.

In the iron trade here, business has shown a decided falling off during the month, merchants and consumers being apparently overbought, and prices are not so firm as they were, iron held in second hands being offered at lower figures, although makers generally are fairly steady at late rates. In pig-iron only a slow demand comes forward, and it is not likely there will be any large weight of buying until after the holidays. Local brands are firm at recent quotations, foundry qualities averaging 46s. 6d. less 2½, delivered Manchester, but in district brands the maximum figures recently quoted by makers are not now obtainable, 42s. for forge and 44s. for foundry Lincolnshire, and 46s. 6d. to 47s. for foundry Derbyshire, net cash, delivered Manchester, being now the average prices. Outside brands offering here have also eased down in price, Middlesbrough being about 3d. to 6d. lower, good foundry qualities averaging 46s. 6d. to 47s. net cash, delivered Manchester, with Eglinton about 47s. 3d. to 47s. 6d. delivered Lancashire ports, and 49s. 6d. delivered Dock Quays, Manchester, net prompt cash.

In finished iron makers have been securing a moderate business, which keeps them well engaged, but the advanced prices for bars are scarcely maintained, Lancashire bars being now obtainable £5 10s. to £5 12s. 6d., with Staffordshire, up to £5 15s.; sheets remain at £7 10s. to £7 12s. 6d.; and hoops £6 2s. 6d. for random to £6 7s. 6d., for special cut lengths, delivered Manchester district, and 2s. 6d. less for shipment.

A strong tone has prevailed in the steel trade, with a hardening tendency in prices. Makers quotations for good foundry hematites remain at 57s. 6d. to 58s. 6d., less 2½d., and steel billets are now quoted £4 10s. to £4 12s. 6d. net cash. Steel boiler plates have got up to about £6 10s. delivered in this district, with, however, not much business doing at this figure.

In the metal market, the opening of the month was marked by a rise in list rates for manufactured goods of ¼d. per lb., and with the continued upward move in raw material, a considerable weight of buying has been going on, and several large contracts placed in the expectation of a further advance in manufactured goods. These expectations have been realised to some extent by an advance of ¼d. per lb. on brass and copper wire, and rolled brass, but on other descriptions, although makers are quoting a similar advance, there is no official alteration in list rates. Delivered in this district, prices are now as under:—Solid drawn brass boiler tubes, 6¼d.; solid drawn brass surface and condenser tubes, 8d.; solid drawn copper tubes, 7¾d.; brazed copper gas and steam tubes, 7½d.; brazed brass gas tubes, 7¼d.; brazed brass machine tubes, 7d.; brass wire, 6d.; copper wire, 7¼d.; rolled brass, 6d. per lb.

In the timber trade a steady business is reported, with prices firm. Imports have been moderate, and deliveries fairly satisfactory, whilst stocks, which generally are none too large, are in some articles light. Of teak the arrivals have been chiefly by steamers, and have gone direct into consumption. The stock is not too heavy, and, in anticipation of probable Government requirements, sellers are now asking a substantial advance on recent prices. In greenheart there has been no import, and with a large demand, stocks have been considerably reduced, and are now much lighter than for several years past.

No specially new feature is noticeable as regards the coal trade, which remains in a depressed condition, with pits, in many cases, not running above four days per week. House coals have been in moderate demand, but with the advent of spring, business is now falling off, and prices are barely maintained at late rates, best house coal averaging 10s. to seconds, 8s. to 8s. 6d.; and common 7s. per ton, at the pitmouth. Steam and forge qualities are in but indifferent request, and although colliery owners are restricting the output, supplies are excessive, with low prices ruling, 6s. representing about the average figure for ordinary qualities at the pitmouth. Engine fuel has shown a hardening tendency, especially in the better qualities, supplies of which are anything but plentiful, and although any better prices are difficult to get, colliery owners will not book forward contracts except at some advance upon present rate. At the pitmouth the better qualities of slack average 4s. 6d. to 5s., with common sorts ranging from 3s. to 3s. 6d. per ton.

For shipment, business continues slow, with no improvement in prices, common steam coal, for bunker purposes, being readily obtainable at 6s. 9d. to 7s., with 7s. 9d. about a maximum figure for better qualities, delivered at the Garston Docks, or at the High Level, Liverpool.

BELFAST TRADE NOTES.

(*From our own Correspondent.*)

A FURTHER improvement has been manifested during March in the condition of both the shipbuilding and engineering trades in Belfast, and judging by the large amount of tonnage now on hand, there should be no lack of work for a considerable time to come. Among the orders booked during the month may be mentioned the following, viz.:—a large twin-screw steamer for the Nippon Yusen Kaisha (Japan Mail Steamship Co.), a single screw steamer for the well-known City Line of Glasgow, and a cargo boat for Messrs. T. & J. Harrison, of Liverpool. The Japanese boat is similar in dimensions to four others lately placed on the Clyde. These orders have all been secured by Messrs. Workman, Clark & Co., Limited, who are now very busy. Messrs. Harland & Wolff's extensive yards are also turning out a large amount of work. Messrs. Victor Coates & Co. are also extremely busy, but principally with land engines. Night shifts are working in all three places and it is improbable that a stoppage of over two days' duration will take place for the usual Easter holiday, which commences on April 6th.

Several steamers of large tonnage have been launched during the month. The first of these was the twin-screw steamer *Iran*, for Messrs. Bates & Co., Liverpool. This vessel is 462 ft. in length, with a tonnage of about 6,100. She will be fitted with twin sets of triple-expansion engines, and all the most approved appliances for working both ship and cargo, as well as with a complete installation of electric light. She will be employed in the Eastern trade. On the following Saturday, March 14th, another large steamer for the same owners was put into the water. The vessel is named the *Istrar*, is 400 ft. long, and with a tonnage of about 4,600. She will be fitted up in a similar manner to the *Iran*, with the exception of being only single screw. Both steamers were launched from the south end of Messrs. Harland & Wolff's yard.

The Belfast shipyard also launched a large barque, named the

Lord Dufferin, from their North yard. The vessel has been built to the order of a Liverpool firm. Her construction was only commenced in the third week of January, so that only two months and a few days have elapsed before the vessel entered the water.

From the same yard another large steamer will be launched for Messrs. A. Holt & Co., Limited, Liverpool, on the 30th of this month.

On the 5th inst. the s.s. *Cestrian* left this port for her trial trip in the Lough, and afterwards proceeded to Liverpool. The *Cestrian* is the third steamer which Messrs. Harland & Wolff have built lately for Messrs. Frederick Leyland & Co., Liverpool, for their Liverpool and Boston service, and is of similar dimensions. These are :—512 ft. long, 59 ft. broad, and 39 ft. deep, of 8,766 tons register, and propelled by single screw engines, with cylinders 31 in., 52 in., and 86 in. diameter, by 66 in. stroke. She will class 100 A1 at Lloyd's, and also carries Board of Trade passenger certificate. Accommodation has been provided for over 900 head of cattle on upper shelter decks. The trial trip was very satisfactory.

The new Johnston liner *Vedamore* is being pushed on with all speed, and should be ready to leave in a fortnight.

The s.s. *Langton Grange* has had all her propelling machinery fitted on board, and is now receiving her refrigerating plant. This work is being done under the superintendence of Mr. Swainston, of London.

The lengthening of the Union Co.'s steamer *Scot* is proceeding rapidly in the Alexandra Dock. She has been drawn apart, and the work of joining up again is now going on. I purpose giving a short description of the whole of this interesting operation when nearing completion. When on this subject, I may be allowed to correct a slight mistake which appears in the weekly paper *Work*. In its issue for March 21st, it is stated that the South African liner *Scot* is being lengthened in the New Southampton Docks.

I was not aware that there were two South African steamers of this name, much less that two of them were being lengthened simultaneously.

Messrs. Burns's cross-channel steamer *Hound*, and the s.s. *Black Head*, belonging to the Ulster Ship Co., have both undergone an extensive overhaul lately; the latter vessel receiving a new tail shaft.

Messrs. Workman, Clark & Co., are repairing the s.s. *Lismore*, which vessel was towed into the port in a disabled condition, having met with very heavy weather off the coast of Ireland, and having rudder post broken and other damages sustained.

The engines of H.M. battleship *Hannibal* are proceeding rapidly in the engine works of the Queen's Island. Part of the shafting and the stern tubes have already been sent off to Pembroke to be put in place prior to launching.

Large quantities of shipbuilding material continue to arrive per steamer from across the Channel.

NORTH-WEST OF ENGLAND.

(From our own Correspondent.)

Barrow.—The announcement that Lord Harris had accepted the post of chairman of the Naval Construction and Armaments Co., recently resigned by the Duke of Devonshire, who is very largely interested in the concern, but who felt the necessity of withdrawing from official connection with the company seeing that the Barrow Co. does so much work for the Admiralty, was news that was popularly received in Barrow, because it is known that Lord Harris, who perhaps is best known as a prominent cricketer, is nevertheless a nobleman of distinctly marked administrative bearing, having served two offices of State, and more recently having been Governor of Bombay. His lordship will henceforward take an active interest in the affairs of the Naval Construction and Armaments Co. This the Duke of Devonshire could not possibly do, owing to the numerous and important engagements he has to fulfil every day of his life. There has, however, been no appointment to the vice-chairmanship of the company, resigned by Lord Brassey when he went out to Australia; but this is a question which is engaging the attention of the Board. During the month no new orders for shipping have been booked by the Barrow Co. They were unfortunate, or perhaps fortunate, in missing any of the orders for third-class cruisers which have been placed on the East Coast, because it is felt that the prices at which this work has been undertaken will yield no profit, especially in view of the general advance in wages which is going on all round, and which must result in a considerable increase in the cost of tonnage built. Other and more important work is coming out from the Admiralty, a share of which the Barrow Co. will endeavour to secure, and with that view efforts are being made to push forward the work in hand towards as early completion and delivery as possible. The work of building the first-class cruiser *Niobe* is proceeding very satisfactorily, and her keel plate and ribs are being set. A large tonnage of the plates and other material required in her construction are accumulating at the yard of the company, and it is evident every effort to complete this great cruiser in even less time than taken with the *Powerful*, the first ship of its class built at Barrow, will be made, and it now seems certain that H.M.S. *Powerful* will be delivered to the Admiralty six months prior to the contract date. Barrow is now well fitted for the rapid completion of all Admiralty work, and the hope is expressed that it may fall to the lot of Barrow to secure from the present programme one of the battleships and some of the other big work to be given out. Tenders have been sent in for one to three of the 30-knot torpedo-boat destroyers, and experiments are being made with a view to tendering for others of an even higher rate of speed—33 knots per hour. That this can be accomplished there can be no doubt, and experiments which are taking place here are more in the direction of securing a perfect and scientific model from a naval architect's point of view than in the matter of engine power, as it is known the latter can easily be provided, especially if the length of hull gives the requisite space for the boilers required, and that of course, will be a condition. The building of the two 30-knot torpedo-boat destroyers, *Avon* and *Bittern*, has made wonderful progress during the month, and it will not be long before these craft are launched. It is astonishing what experience does in this class of work. The engines are already well on their way, and the work of building the Thornycroft boilers with which these torpedo boat destroyers will be fitted has already been commenced. The only other craft on the slipway at Barrow at present are two 4,000 ton steamers for the Clan Line, one the *Clan Lindsay*, which will be launched on April 2nd, and the other which as yet is only known by a number.

The Devonshire Dock, at Barrow, is at present a busy hive of engineering industry, as the work incidental to the engineering and fitting up of the *Powerful*, *Juno* and *Doris* is finding employment for a considerable body of men, and efforts are being made to complete this work at the earliest possible date. At present the *Doris* is receiving her boilers and engines, and in a week or two she will be removed from under the 100-ton crane to make room for the new Clan Liner, which, however, will only remain in this position for a week after being launched, and then the *Powerful* will go alongside again to receive her finishing touches before being put on her dock trials. Her boilers are all fixed and her engines are ready to turn round. By the end of June this monster cruiser will be ready for sea and for delivery to the Admiralty. The *Juno* will also be ready about the same time. The engineering and boiler-making departments of the Naval Construction and Armaments Co.'s works are exceedingly busy, and generally speaking more forward with their work than they have been for some time past, under the management of Mr. McKechnie. The new engines of the s.s. *Clan Sinclair* are being built, and the boilers are also well in hand.

Shipbuilding Material.—The new Admiralty programme has brought about new life in the shipbuilding material trade, and the mills at Barrow are all very busily employed, orders being plentifully held and plentifully offered, but it is evident the Barrow Steel Co. requiries additional Siemens-Martin furnaces to feed their mills, as they are capable of producing vastly more material than the furnaces can supply them with. This defect will, however, soon be remedied, especially in view of the good paying prices which are now ruling for plates and other classes of material. Plates are quoted firmly at £5 2s. 6d. net cash. There are reasons to believe that some of the West Cumberland steel makers intend soon to devote their attention to the production of shipbuilding material, as their position on the seaboard gives them undoubted advantage for cheap delivery to points of consumption. The trade doing in bolts, rivets, chains and anchors is so large as to suggest the expediency at an early date of works being provided in this district for this type of product. There is a big trade doing in heavy steel castings, chiefly for shipbuilding work, and overtime is being worked all round.

Generally speaking, prospects of the steel trade in the North-West of England are good, and there is a growing disposition to make the trade more of a Siemen-Martin's type than of the Bessemer type, although the latter department is briskly employed. But it is felt that the future of steel is more with the former than with the latter class of metal, and a movement is being made to develop this branch in the direction of a heavy production of armour-plates and other classes of material required by war vessels.

The Hematite Trade.—The life reported last month in the hematite pig-iron trade is maintained all round, and it has been found necessary to increase the output. At present 39 furnaces are in blast, compared with 26 in the corresponding week of last year. Makers are all very well sold forward to the extent of from four to six months, and as there are prospects of a continuance of activity for a long time to come, makers will not negotiate business at lower rates than from 49s. 6d. to 50s. 6d., while warrant iron, which moves up and down at the caprice of the speculative barometer, is quoted at 48s. 4d. net cash sellers, and 48s. 3½d buyers. Stocks are firmly held, and represent about 300,000 tons in warrant stores. Makers are holding no stocks except in cases where they are also makers of steel and require to hold reserve supplies of metal.

Shipping.—The shipping trade is showing new life, and although freights remain low, tonnages show an increase in metal export compared with the corresponding time of last year. Prospects, however, are very cheering, and it is evident a brisk export trade will be done during the year.

Littoral Drift.—At the ordinary meeting of the Institution of Civil Engineers, on Tuesday, the 3rd March, Mr. W. H. Preece, C.B., Vice-President, in the chair, the paper read was on "Littoral Drift: in relation to River-Outfalls and to Harbour-Entrances," by Mr. W. H. Wheeler, M.Inst.C.E. The author pointed out that the success or failure of works projected for the improvement of navigation on coasts subject to littoral drift depended on a correct application of the laws which governed the movement of sand, shingle and alluvial matter. It was shown that the supply of drift was limited and within control; and that the vast beds of sand with which the sea-bed was covered, and the deposits of sand and shingle found on many parts of the coast were due to causes which occurred in remote ages under entirely different conditions to those now prevailing. Instances were given to prove the impossibility of these accumulations having been formed by existing agencies. The drift which now travelled along the coast and the movable sand-beds were shown to be due to the erosion of the cliffs, and as coming from the waste of the land and not from the sea-bed. It was stated that the generally accepted theory, that the travel of drift along a coast was due to and was in the direction of the prevailing wind, was contrary to fact. In England the prevailing winds were from the south-west; whereas the travel of drift on the east coast was southwards, on the south coast from the westwards, and on the west coast northwards, in each case being in the same direction as the flood tide. Round bays and estuaries, frequently within a very limited area, the travel was in three or four different directions. Numerous examples of drift in England and other countries were given, and in every case the continuous and regular travel was in the direction of the flood tide. The author had been unable to find a single instance where the regular and continuous travel of drift along a coast was in the opposite direction to that of the flood tide. Storms which blew in an opposite direction to the flood tide arrested the progress of the drift, and even for a time caused it to travel against it; but these were only occasional, and on their cessation the normal direction of travel was resumed. While winds and waves were the agents which operated in eroding cliffs and producing the supply of drift, the continuous progressive movement of sand and shingle along the sea coast was caused by the wave action of the flood tide, which was increased when the wind blew in the same direction as the flood tide. The action of the flood tide making along a coast did not consist in a gradual swelling or raising of the water, but a series of small waves were given off from the main tidal wave, which broke on the shore in an oblique direction, the crest running up and partly lifting and partly pushing the stones forward and onward to the height reached by the wave, and consequently several feet above high-water mark. The retiring wave descended down the line of quickest descent, or that normal to the beach, and carried with it the greater portion of the material lifted up, leaving the remainder behind. The crest of the wave being wedge-shaped, the thin film of water at the top, as it retired, was incapable of carrying back the larger stones driven up by the momentum of the body of water behind, and these were left near the top of the bank. The number of wavelets varied between ten and twenty per minutes making, with the smaller number, 7,200 impulses on the flood tide in the course of a day, and consequently capable of elevating and transporting a large quantity of material in the course of a year. The weight of the stones moved by these tidal shore waves in calm weather varied between a fraction of an ounce and 5 lbs. or 6 lbs. when out of the water. The shore waves of the ebb tide struck the beach at the same angle as those of the flood, and the tendency was therefore to prevent any retrogressive movement. With regard to alluvial matter in estuaries, it was shown that this was derived from detritus brought down by rivers, and did not come from the sea, and that it was not supplied from the waste of clay or chalk cliffs along the sea coast. The only current along the coasts of England which could transport material in suspension was that due to the tidal wave, which travelled each way for about six hours at the rate of between 2 knots and 2½ knots. The greatest distance material could be carried in one direction in suspension was therefore 15 miles, and as the material eroded from the cliffs was not reached until some time after the tide had been running it would be carried a shorter distance toward the mouth of an estuary on the flood than away from it on the ebb, and with each tide would become more and more diffused over a great volume of water. It was contrary to all known laws of tidal action in rivers for material in suspension to be carried upwards for any great distance above the mouth of a river or estuary. The tidal wave propagated up a river created only an oscillating current, and the same quantity of tidal water which went up returned on the ebb, with the addition of the current produced by the fresh water; the tendency of movement was, therefore, downward, and not upward. As a further proof that solid matter in suspension could not be carried up a tidal river for any great distance, the salt from the sea, which was far more readily diffused than solid matter, penetrated only the lower reaches, the water entirely losing its saline properties as the tidal current progressed upwards. Except in very heavy gales, submerged sand-beds were not subject to alteration. So long as the natural conditions remained unaltered and the set of the tides was not interfered with, the equilibrium originally established between the several contending forces would remain. The effect of wave-action diminished rapidly as the depth increased, and while this action was only occasional, the tidal currents were continuous. When a channel was sufficiently deep to resist the surface-action of the winds, the tidal currents would maintain it. Numerous examples of the permanency of natural channels passing through sand-beds were given, and it was pointed out that the improvements which had been effected in dredging by means of sand-pumps rendered it practicable to permanently deepen the channels of the outfalls of rivers in sandy estuaries and the estuaries to harbours. The results obtained by dredging in the Harbour of New York, on the Mersey Bar, across the Stroombank at Ostend, and across the Charpentier Bank at the mouth of the Loire, were sufficient to show that it was practicable to improve the approach to harbours on sandy coasts by suction-dredging without the aid of training-walls, and at considerably less cost. Applying these facts, the following principles were deduced as essential in the construction of harbours on shingly or sandy coasts: (1) that piers running out from the coast should be so projected as not to derange the main set of the tidal stream, and be so designed as not to cause an eddy-current at the entrance to the harbour; (2) that the entrance to a harbour should be sufficiently large to prevent any strong set into it on the rising tide and to allow of its being filled with a current of lower velocity than that of the flood tide past the front of the entrance; (3) that the piers should project out from the coast into water of sufficient depth to be free from the action of littoral drift and beyond the local influence of matter in suspension derived from the waste of cliffs or detritus brought down by rivers. Several examples of harbours were given which had been successful or otherwise, dependent upon compliance with these principles in their construction.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES.—English.

Maritta.—On February 13th there was launched on the Tyne by Sir W. G. Armstrong & Co., a steel screw cargo steamer, built to the order of La Société Anonyme Belge de Navigation à Vapeur, managed by Messrs. Schenker, Walford & Co., London. The chief dimensions of the vessel are:—Length, 330 ft.; breadth, 46 ft.; depth, moulded, 26 ft. The deadweight carrying capacity is about 5,000 tons. The vessel was named *Maritta*, and was taken to the works of the Wallsend Slipway & Engineering Co., where she will be fitted with triple-expansion engines, which will embrace all the latest improvements.

Breeze.—On February 26th there was launched from the shipbuilding yard of Messrs. Wood, Skinner & Co., at Bill Quay-on-Tyne, a new steel screw steamer, which has been built to the order of Mr. Wm. Kinnear, of Dundee. The following are the principal dimensions of the vessel, viz.:—Length overall, 188 ft.; breadth, moulded, 29 ft.; depth, moulded, 13 ft. 6 in. The vessel is of the long raised quarter-deck type, the cabins being arranged in the bridge amidships with entrance through house on bridge deck, while the crew are berthed in the topgallant forecastle. Water ballast is provided in the cellular double bottom all fore and aft. The steamer will be rigged as a fore-and-aft schooner, and will be fitted with every recent improvement and appliance for facilitating the rapid loading and discharging of cargo of a heavy character, which she is specially adapted for carrying, having extra large hatchways to take in same. She has been built to Lloyd's highest classification, and has also been superintended during construction by Mr. J. Baxter, of Newcastle, on behalf of the owner. Messrs. George Clark, Limited, of the Southwick Engine Works, Sunderland, will fit the vessel with a set of triple-expansion engines, having cylinders 13½ in., 22 in., and 36 in. diameter respectively, with a stroke of 27 in., to be supplied with steam from a large steel boiler, which have also been constructed to Lloyd's requirements. As the vessel glided into the water she was named *Breeze* by Miss Dent, of Jesmond, Newcastle, and was at once taken round to Sunderland to receive her machinery.

Islander.—On Thursday, February 27th, there was launched from the yard of Messrs. Robert Thompson & Sons, Southwick, a finely-modelled screw steamer, built to the order of Messrs. Mark Whitwell & Son, Bristol. Dimensions:—Length b.p., 150 ft.; breadth, 24 ft.; depth, moulded, 11 ft. 10½ in.; designed to carry about 470 tons on Lloyd's freeboard, and steam 10 knots, with a net register of about 110 tons. She has long quarterdeck and bridge, with accommodation for captain and officers and a few passengers. Engineers are placed aft, with crew in topgallant forecastle, chart and wheelhouse on bridge. Ample water ballast is provided in double bottom throughout both holds, also fore and after peak, to enable her to make quick passages in ballast. The deck arrangements consist of large hatches to both holds, with powerful steam winch to each, with derricks fitted to work both sides. Meredith donkey boiler steam steering gear is placed in the engine-room and connected to wheel on bridge with shafting, also screw gear and wheel and quadrant aft. Vessel is schooner rigged, with raking pole masts, and is fitted with all the latest improvements for cargo and passenger vessel. The engines and boiler are being fitted by Messrs. Jameson & MacColl, Sunderland. During construction the vessel has been under the personal superintendence of Captain Mail, and the engines by Mr. Carter. As the vessel left the ways she was gracefully christened the *Islander* by Mrs. Whitwell.

Ellen Rickmers.—On February 27th at Messrs. J. L. Thompson & Sons, Limited, North Sands shipbuilding yard, a finely modelled screw steamer, the *Ellen Rickmers*, was launched. There was a large gathering of sightseers, and everything went off with the utmost *éclat*. In fact, the launch may be described as one of the most successful that has taken place for some time, the monster vessel leaving the stays so easily and gracefully, and without the slightest hitch of any kind. Miss Nellie Marr performed the christening ceremony. The vessel is one of two built to the order of Messrs. Rickmers, Reismuhlen, Rhedered & Schiffbau, A.G., of Bremen, and she is intended for the rice trade, to ply mainly between China and Bremen. She is 427 ft. long, 50 ft. 6 in. wide, and 30 ft. depth, moulded, and is designed to carry a deadweight of over 7,200 tons, with Lloyd's summer freeboard. She has been built to Lloyd's highest class under special survey on the three-deck rules, and has a full poop, long bridge, and topgallant forecastle. The poop is arranged for cargo, and the officers' and engineers' berths and the spare state-rooms and saloon are placed in a house built on the top of the bridge deck. On the top of this saloon house is placed the chart and wheel-houses. The crew are berthed in the topgallant forecastle. The vessel is built on the web-frame principle, with intercostal stringers right fore and aft. The upper and main decks are of steel, the poop, bridge, and forecastle decks being of wood. Special attention has been paid to the loading and discharging arrangements, nine derricks being fitted, six of which are steel. Seven powerful steam winches are placed on deck at the hatches, while the steam windlass is on the forecastle deck. The steam steering gear is placed at the after end of the engine-room, and is controlled by a wheel from the steering house on the bridge forward. A powerful screw gear is placed at the after end of the poop. Water ballast is carried in a cellular double bottom, right fore and aft, and in the after peak. The vessel is fore and aft schooner rigged, with pole masts. On the upper bridge deck amidships are placed four large boats, the two lifeboats being of seamless steel. The vessel has a graceful clipper stem finished off with a well-carved figurehead, and elaborate trail boards running away from this. The steamer is intended for Messrs. Rickmers' line between Europe and the East, and will further add to the reputation of the builders, being a notable addition to the many modern, up-to-date cargo carriers which they have recently turned out. The engines are by Messrs. John Dickinson & Sons, Limited, and are of the following sizes:—27 in., 43 in., and 72 in., with a stroke of 48 in. Steam is supplied by three multitubular boilers, working at 180 lbs. pressure, and all the most modern improvements in propelling machinery are fitted, including Howden's forced draught arangement for the boilers. Subsequently those present at the ceremony adjourned to the company's offices. The company consisted of—Mr. and Mrs. A. Heine, representatives of the owners, Mr. A. Rickmers, Mr. R. Thompson, J.P., Mr. Charles Thompson, Mr. Joseph Thompson, and Mr. Norman Thompson, Mr. James Marr, Mr. P. Phorson, Mr. Fred. Dickenson, Mr. James Dickenson, Mr. A. Dickenson, Mr. J. A. Bowdon, Dr. Todd, Mr. Bourne (of Messrs. Wigham Richardson & Co., of Newcastle); Mrs. Jno. Marychurch, of Cardiff; Mrs. R. Thompson, Mrs. Humphrey, Miss Darling, Mrs. and Miss Nellie Marr. Mr. Robert Thompson, J.P., gave the toast "Success to the *Ellen Rickmers*," hoping that, though it was the last of the first lot, it would not be the last lot of the same class which the company would receive from the same firm. Mr. R. Thompson also gave "the health and future happiness of the lady who had performed the ceremony that day." He hoped she would sail through life as pleasantly as the vessel sailed into the river that day; that she would never meet troubles half-way, but when they did come they would be easily got over. The company then dispersed.

Shadwell. — On February 27th there was launched by Messrs. R. Stephenson & Co., Limited, at Hebburn-on-Tyne, an iron towing hopper barge, built to the order of the South Shields Corporation. This barge has been specially designed by Mr. C. H. Tate, naval architect, Newcastle, for the removal of the town refuse of South Shields. The hopper is of large capacity, to enable her to take to sea 350 tons of this refuse. The vessel was named the *Shadwell*.

Yashima.—On February 28th there was launched from the Elswick Shipyard of Sir W. G. Armstrong, Mitchell & Co., a battleship which that firm has built to the order of the Japanese Government. The *Yashima* is 412 ft. long over all, and 372 ft. between perpendiculars. The maximum moulded breadth is 73 ft. 6 in., and the mean draught will be 43 ft. 7½ in. The displacement with normal coal and all armament, stores, &c., on board will be 12,300 tons. The ship will be propelled by twin screws, the engines, which are supplied by Messrs. Humphrys, Tennant & Co., of Deptford, being of the three-stage compound type. The cylinders are 40 in., 59 in., and 88 in. in diameter by 3 ft. 9 in. stroke. The design is similar to that now usually placed in war vessels, being of the inverted direct-acting type, with separate condensers. The boilers, ten in all, are of the ordinary return-tube type, and are single-ended, having four furnaces each. The steam pressure is to be 155 lbs. to the square inch. The estimated H.P. is 10,000 indicated with natural draught, and 13,500 indicated with limited forced draught. The corresponding speeds for these powers are 16 and 18½ knots respectively. The coal capacity will be at normal draught 700 tons, but the bunkers are constructed to hold 1,200 tons. The ship is extensively subdivided, there being 181 watertight compartments in all. Of these 36 will be in the double bottom, 70 in the hold, 18 on the platform deck, 29 on the lower deck, 22 on the belt deck, and six on the main deck.

Talisman.—On February 28th Messrs. Ropner & Son, of Stockton, launched a steel screw steamer of the following dimensions, viz.:—Length between perpendiculars, 270 ft.; breadth, 39 ft. 6 in.; depth moulded, 17 ft. 6 in.; which they have built for Norwegian account. The steamer is built off the part awning decked rule, having poop and raised quarter-deck; the deadweight carrying capacity being 2,600 tons on 16½ ft., the saloon and cabins for the captain and officers are fitted in the poop, whilst the engineers are accommodated in iron houses placed on the awning deck near the entrance to engine-room. She is built on the web-frame principle, leaving the holds entirely clear for cargo, and carries her water ballast in a cellular bottom, and in the after peak; all labour-saving appliances are fitted for the economical working of the steamer, and also for the expeditious loading and unloading of cargoes; she has steam steering gear amidships, and screw gear aft, four powerful steam winches, a large multitubular donkey boiler, direct steam windlass, stockless anchors, &c. The engines will work up to about 700 effective H.P., and are by Messrs. Blair & Co., having cylinders 19½ in., 32½ in., by 52½ in. by 36 in. stroke. Steam is supplied by two large steel boilers working at 160 lbs. pressure. The steamer was named the *Talisman* by Mrs. C. A. Bushell, of Newcastle-on-Tyne.

Emperor Nicholas II.—On February 28th Messrs. William Dobson & Co. launched at Low Walker-on-Tyne a steel twin-screw steamer, which they have built to the order of the Archangel Mourman Steam Navigation Co., of Archangel, for their mail, passenger, and cargo service between Archangel and the ports of the Mourman coast. The dimensions of the vessel are:—Length, 250 ft.; breadth, 32 ft.; and depth moulded, 20 ft. The hull and machinery are both constructed to meet the requirements of Lloyd's highest class. The propelling machinery has been constructed by the North-Eastern Marine Engineering Co., Limited, of Wallsend. It consists of two sets of triple-expansion engines having cylinders 14 in., 22½ in., and 37 in. diameter, with a stroke of 27 in. On leaving the ways the vessel was christened *Emperor Nicholas II*.

Glasgow.—On February 28th a steel steamer of about 2,630 tons, was launched at Whitby, owned by Messrs. Maclay & Macintyre, Glasgow.

Umtali.—On February 29th the *Umtali*, a steel steamer, was launched at Sunderland, owned by Messrs. Bullard, King & Co., London.

Inchmona.—On February 29th there was launched from the yard of Messrs. Wm. Gray & Co., Limited, West Hartlepool, a screw steamer of the following dimensions:—335 ft. by 46 ft. 6 in. by 26 ft. 4 in. moulded depth, constructed to carry a cargo of 5,000 tons of deadweight on shallow draught, viz., 20 ft. 6 in. She has topgallant forecastle, long bridge amidships, hood and small house aft, is arranged for 920 tons water ballast in double bottom forward and deep cargo tank aft, and is the first vessel built on an improved spar deck plan which combines large deadweight with cubic capacity. The upper deck, deep ballast tank, bulkheads, floors and tank tops are iron. The machinery of this vessel forms a new departure in marine engineering, the results of which are being awaited with much interest in shipowning and engineering circles. Instead of the usual triple-expansion engines, working at the pressure in vogue at the present day, the vessel will be fitted at the Central Marine Engine Works with the first set of Mudd's patent five-crank engines, working in quadruple expansion, with a pressure of 255 lbs. per square inch. This pressure is being provided by two of the ordinary Marine Type Multitubular Cylindrical Boilers, working under induced draught. The object of this departure is to attain a higher economy of fuel than has been possible with the triple engine, and as a full exposition of the principles upon which the change is based would require lengthy treatment, it may suffice for the present to state that all parties interested in the success of this steamer have high hopes that the desired economy in working will be amply attained. Much credit is due to the owners and builders for their enterprise in making such a departure from the beaten track in the design of marine engines, and the attainment of the expected results will mark an epoch in steamship efficiency. The steamer has been built to Lloyd's highest class to the order of Messrs. Hamilton, Fraser & Co., Liverpool, both hull and machinery being under the superintendence of their engineer, Mr. J. B. Edmiston, and the ceremony of naming the vessel *Inchmona* was gracefully performed by Mrs. W. C. Gray, of West Hartlepool.

Clarence.—On Saturday afternoon, February 29th, Messrs. Craig, Taylor & Co. launched from their Thornaby Shipbuilding Yard, Thornaby-on-Tees, the *Clarence*, a handsomely modelled steel screw steamer, to the order of F. le Boulanger, of Swansea. The dimensions of the vessel are 254 ft. by 37 ft. by 18 ft., and she is to the highest class in Lloyd's. She is built on the web-frame principle, and has raised quarterdeck, bridge, and topgallant forecastle. She is fitted for water ballast in double bottom fore and aft, and also in peaks. The engines are being constructed by Messrs. Westgarth, English & Co., Middlesborough, and are of the following sizes, viz., 19 in., 31 in., and 51 in. by 33 in. stroke, with two large boilers to work at 160 lbs. pressure. She will be equipped with four large double-powered steam winches and patent steam steering gear by Messrs. R. Roger & Co., patent direct steam windlass by Messrs. Emerson, Walker, & Thompson Bros., Limited, and all the latest improvements for rapid loading and discharging. The hull of the vessel has been built under the superintendence of Mr. George Eldridge, whilst Mr. Conway has superintended the construction of the machinery. The christening ceremony was gracefully performed by Mrs. le Boulanger, the wife of the owner. She was presented with a very pretty bouquet by Master Robin Craig.

Howe.—On March 2nd there was launched by Messrs. Cochrane & Cooper, at Grovehill, Beverley, a new steam trawler, 93 ft. by 20 ft. by 10 ft. depth of hold, built to the order of Mr. William Grant, of Grimsby. The vessel, which is to be fitted with 40 H.P. triple-expansion engines, by Messrs. C. D. Holmes & Co., of Hull, was christened the *Howe*.

Prince.—On March 3rd there was launched by Messrs. Cochrane & Cooper, at Grovehill, Beverley, a steam trawler, built to the order of the Anchor Steam Fishing Co., Limited, Grimsby, of the following dimensions:—93 ft. by 20 ft. by 11 ft. depth of hold. The vessel, which is to be fitted with 40 N.P. triple-expansion engines, by Earle's Co., of Hull, was christened the *Prince*.

Radley.—On March 3rd Messrs. Priestman launched at Sunderland a modern cargo steamer for Messrs. Galbraith, Pembroke & Co., of London. Her dimensions are the same as those of the *Charterhouse*, constructed last year for the same owners, viz.:—Length, 336 ft.; breadth, 45 ft. 6 in.; depth, moulded, 26 ft. 1 in., with a carrying capacity of 4,900 tons. She is built to Lloyd's highest class, on the deep frame principle to semi-spar deck requirements. Engines of the triple-expansion type will be supplied by Messrs. Blair & Co., Stockton, having cylinders 24 in., 40 in., and 66 in., with 45 in. stroke. There are two large boilers of the single-ended type design, for a working pressure of 160 lb. per square inch. The vessel was named the *Radley*.

Fitzpatrick.—On Tuesday, March 3rd, there was launched from the yard of the Tyne Iron Shipbuilding Co., Limited, of Willington Quay-on-Tyne, a steel-screw steamer, built to the order of Messrs. Burrell & Son, of Glasgow, and of the following dimensions, viz.:—Length, 365 ft.; breadth, 47 ft.; depth, 29 ft. 9 in., moulded, and to class 100 A1 at Lloyd's, on the three-decked rule. This vessel has water ballast, fitted right fore and aft on the cellular system, and is also fitted with all modern improvements for the rapid loading and discharging of cargo, including 7 double-cylindered steam winches, direct acting steam windlass, by Emerson, Walker & Co., large donkey boiler, steam steering gear, by Messrs. T. Caldwell & Co., Limited, and Hastie's screw gear aft. The engines, which are to be supplied by Messrs. North Eastern Marine Engineering Co., Limited, are of the triple-expansion type, having cylinders 27 in., 43 in., and 72 in. by 45 in. stroke, and working at a pressure of 170 lbs. On leaving the ways the vessel was named *Fitzpatrick* by Mrs. Roland Philipson, of Tynemouth.

Thrunscoe.—On Tuesday, March 3rd, Messrs. Furness, Withy & Co., Limited, launched from their yard at Hartlepool a large steel screw steamer, built to the order of Messrs. Bennetts & Co., Grimsby. She is a fine type of a modern cargo boat, measuring over 340 ft. in length, and built throughout of Siemens-Martin steel, with a large measurement and deadweight capacity, and built to the highest class at Lloyd's. The vessel is of the spar-deck type, with poop, bridge, and forecastle. The holds are fitted with iron grain divisions, and all decks, deck erections, skylights, bulwarks, bulkheads, etc., are constructed of steel and iron, cellular double bottom all fore and aft for water ballast, the after-peak being also available as a tank. The greater portion of the plates are in 24 ft. lengths, making the structure of the ship very strong. Four steam winches, one donkey boiler, patent steam steering-gear amidships with screw gear aft, direct steam patent windlass, by Emerson, Walker & Co., stockless anchors, hauling into hawse pipes, and other modern appliances are fitted for the handy working of the vessel. The saloon and cabin providing accommodation for the captain, &c., is handsomely finished in polished hardwood, with painted panels, executed in an effective style by the staff of ladies employed by the firm. The steamer will be rigged as a two-masted fore-and-aft schooner, and has been constructed under the personal supervision of Mr. Squires. She will be fitted with triple-expansion engines by Messrs. W. Allan & Co., Limited, Sunderland. On leaving the ways she was gracefully christened *Thrunscoe* by Miss Squires.

Capitan Muniz Gamero.—On March 3rd Messrs. Laird Brothers, of Birkenhead, launched the second of four 30-knot torpedo-boat destroyers, which they are building for the Chilian Government. She was named *Capitan Muniz Gamero*. These vessels were ordered in August last.

Toronto.—On March 4th an iron ketch-rigged steamer, of about 150 tons, named the *Toronto*, was launched at Hull, owned by the Hull Steam Fishing and Ice Co., of Hull.

Zero.—On Thursday, March 12th, there was launched from the shipbuilding yard of Messrs. J. L. Thompson & Sons, Limited, North Sands, the steamer *Zero*, built to the order of Messrs. Turner, Brightman & Co., London. This vessel is of the partial awning-deck type, having long raised quarter-deck, and has been built under special survey for Lloyd's highest classification. She is of the following dimensions, viz.:—Length, 330 ft.; breadth, 42 ft.; depth moulded, 23 ft. 7½ in.; with a deadweight carrying capacity of about 4,500 tons. The captain's, officers' and engineers' accommodation and spare state-rooms are arranged in sidehouses under shelter deck, which extends the length of the engine and boiler space amidships, where the saloon is also placed, with chart and wheel-house on top. The engines are by Messrs. Blair & Co., Limited, of Stockton, and are of the triple-expansion type, having cylinders 23½ in., 39 in., and 64 in. diameter respectively, with a stroke of 42 in., being supplied with steam from three boilers of the multitubular form, of a working pressure of 160 lbs. per square inch. The fore-and-after holds of the *Zero* will be insulated and refrigerating apparatus fitted for the carrying of fresh meat for the River Plate Fresh Meat Co., of London, in whose service the vessel will be placed. On leaving the ways the *Zero* was christened by Mrs. Wood. During construction the vessel has been under the superintendence of Mr. P. J. McCabe, on behalf of the owners.

Argo and Bravo.—On March 12th two steam trawlers, named respectively the *Argo* and the *Bravo*, were launched by Earle's Co., at Hull, for the Ocean Steam Fishing Co., of Grimsby. They are 93 ft. 6 in. long, 20 ft. 6 in. beam, 10 ft. 6 in. depth of hold, and are built to Lloyd's highest class. The machinery consists of triple-compound engines, working on three cranks, and having cylinders 10½ in., 17 in., and 30 in. diameter, by 21-inch stroke.

Parthia.—On Friday, March 13th, Messrs. Richardson, Duck & Co. launched from their building yard a steel screw steamer of the following dimensions:—Length over all, 309 ft.; breadth, extreme, 42 ft.; depth, moulded, 27 ft. 6 in.; tonnage gross, about 2,730 tons. The vessel has been built under special survey, and will take Lloyd's 100 A1 class. She is of the complete awning deck type, with a large deckhouse forward of engine casing, in which accommodation is provided for 12 passengers, an upper deckhouse being fitted for captain, smoke-room, and chart-room. The officers and engineers are berthed on each side of casing. The vessel has a cellular double bottom all fore and aft, which, together with the after-peak, is arranged for water ballast. She will be schooner-rigged, and her equipment includes four large steam winches, steam steering gear, stockless anchors, direct steam windlass, by Emerson, Walker & Co., and all the latest appliances to facilitate loading, discharging, &c. Her engines are by Messrs. Blair & Co., cylinders 22½ in., 37 in., and 61 in. by 42 in. stroke, with two large single-ended boilers, working at 160 lbs. pressure. The vessel has been built to the order of Messrs. A. C. de Freitas & Co., for their South Brazil trade. As she left the ways she was christened *Parthia* by Miss E. Dale, daughter of Dr. Dale, J.P., of Stockton-on-Tees.

Ebane.—On Saturday, March 14th, Messrs. Wm. Gray & Co., Limited, launched a handsomely modelled screw steamer of the following dimensions, viz.:—Length, over all, 270 ft.; breadth, 36 ft. 2 in.; and depth, 22 ft. 8 in.; built to the order of the African Association, of Liverpool, for their line of steamers between that port, the Continent, and the West Coast of Africa. The vessel takes Lloyd's highest class, is built of Siemens-Martin mild steel, with poop for passengers, having well lighted berths and tasteful saloon and smoking-room above. The engineers' and officers' rooms are amidships in long bridge, and the crew's berths in the topgallant forecastle. An ice-room is fitted under the deck, and electric bells will be fitted in the cabins. Electric light installation will be provided for lighting the ship throughout. A cellular double bottom is fitted throughout for water ballast. All the usual first-class working appliances will be provided, including patent stockless anchors, stowing into hawsepipes, patent direct steam windlass, by Emerson, Walker & Co., multitubular donkey boiler, four steam winches, steam crane, patent steam steering gear amidships, hand screw gear aft, and two pole masts, with fore-and-aft rig, &c. The Central Marine Engine Works of Messrs. Wm. Gray & Co., Limited, supply the engines, which are of the triple-expansion type, of 1,200 H.P., and two large steel boilers to work at 160 lbs. pressure per square inch. The hull and machinery have been built under the superintendence of Mr. E. H. Bushell, of Liverpool, on behalf of the owners. The ceremony of christening the ship *Ebane* was gracefully performed by Mrs. John Holt, wife of the chairman of the African Association, Limited.

Yorke.—On March 17th Messrs. S. P. Austin & Son launched from the Wear Dock Yard a steel-screw steamer for the general over-sea trades. The vessel was named *Yorke* by Mrs. Austin.

Dorothy.—On March 17th Messrs. Ropner & Son, of Stockton-on-Tees, launched a steel-screw steamer of the following dimensions, viz.:—Length between perpendiculars, 290 ft.; breadth, extreme, 43 ft.; moulded depth, 19 ft. 9 in.; which they have built for Messrs. J. S. Allison & Co., West Hartlepool. The steamer is built off the part awning deck rule, with poop and raised quarterdeck, her deadweight carrying capacity being 3,500 tons on 18½ ft. The saloon and cabins for captain and officers are fitted in the poop, the engineers' accommodation being amidship. She is built on the web-frame principle, leaving the holds entirely clear for cargo, and carries her water ballast in a cellular bottom and in the after-peak. All labour-saving appliances are fitted for the economical working of the steamer, and also for the expeditious loading and unloading of cargoes. She has steam steering gear amidship and screw gear aft, four powerful steam winches, two large donkey boilers, direct steam windlass, stockless anchors, &c. The engines will work up to about 900 effective H.P., and are by Messrs. Thomas Richardson & Sons, Limited, having cylinders 21½ in., 35 in., and 59 in. by 39 in. stroke, steam being supplied by two large steel boilers working at 160 lbs. pressure. Mrs. Allison, wife of the managing owner, named the steamer *Dorothy*.

Asturia.—On March 17th there was launched from the Jarrow yard of Messrs. Palmer's Shipbuilding and Iron Co., Limited, a large screw steamer, built to the order of the Hamburg-American Steam Navigation Co., Hamburg. Her dimensions are as follows:—Length, between perpendiculars, 390 ft.; beam, 53 ft.; depth, moulded, about 29 ft. The vessel will be rigged as a two-masted fore-and-aft schooner, and has been constructed under special survey to obtain German Lloyd's highest class, and is of the three-deck type, with a combined poop and bridge extending to after end of main hatch, and a topgallant forecastle. The main and upper decks are of steel all fore and aft, and all the exposed decks are sheathed with wood. A double bottom for water ballast is fitted all fore and aft, and divided at the centre line for the purpose of assisting to trim the vessel, a separate system of piping being fitted on each side of centre-line division, enabling each compartment to be filled and emptied independently. The vessel has been designed for the emigrant, cattle, and general cargo trade, and will be lighted throughout by electricity, and fitted complete with all the latest improvements for this service. The accommodation for the captain, officers, engineers, and also galleys and emigrants' hospitals, &c., will be in deckhouses on the top of the bridge and in side houses in fore end of bridge; the remainder of the poop and bridge, and also part of the lower 'tween deck aft, will be fitted with accommodation for 300 to 400 emigrants. The emigrants' berths are of Hoskins' latest patent, and are fitted along each side in separate rooms for ten persons each, the centre of the deck being left clear for the table, seats, &c. The whole of the fittings are portable, and the space may thus be readily converted for carrying cattle or general cargo. The remainder of the 'tween decks, not occupied by the emigrants, will be fitted for cattle, and a complete system of water service, sidelights, fan ventilators, &c., will be supplied and fitted as in first-class cattle boats. A small insulated space is fitted in the lower hold aft with refrigerating machinery, &c., complete for stowing ice, vegetables, and meat for the use of the emigrants and crew. The remainder of space in lower holds to be fitted for general cargo and a complete system of steam winches, derricks, and steam cranes for the efficient working of general cargoes, will be fitted. The engines, which are also built by the Palmer Co., are of the triple-expansion type, with cylinders 27 in., 45½ in., and 74 in. by 48 in. stroke, steam being supplied by three single-ended boilers 15 ft. 9 in. diameter by 11 ft. long; working pressure of steam, 180 lbs. All modern apparatus and appliances for the most efficient and economical working are being fitted, and the whole of the vessel and machinery is being constructed to meet the requirements of the German emigrant service. The vessel was gracefully launched by Mrs. Viereck, wife of Mr. Viereck, the superintending engineer of the vessel, and was christened the *Asturia* by Mrs. Spicer, of Whitley.

Trevose.—On March 18th there was launched from the shipbuilding yard of Messrs. John Readhead & Sons West Docks, South Shields, a new steel screw steamer of the following dimensions, viz.:—Length, 323 ft. by 47 ft. by 25 ft. moulded depth. The vessel is intended for general trade, is of the new improved single deck type, and is fitted up with all the latest improvements for rapid loading and discharging of the cargo. Her engines, also built by Messrs. John Readhead & Sons, are of the triple-expansion type, having cylinders 24 in., 40 in., and 64 in. by 42-in. stroke, steam being supplied from two large steel boilers, working at a pressure of 160 lbs. per square inch. The steamer has been built to the order of Messrs. Edward Hain & Son, St. Ives, Cornwall, and is the thirtieth vessel built by Messrs. John Readhead & Sons for the same owners. She is named the *Trevose*.

Chater-dag.—On March 18th Messrs. R. and W. Hawthorn, Leslie & Co., Limited, launched at Hebburn-on-Tyne a steel screw steamer for the Black Sea trade. She is one of three vessels building for the Russian Steam Navigation and Trading Co., of Odessa. Her dimensions are:—220 ft. by 34 ft. by 14 ft. moulded, and she has a deadweight capacity of 1,100 tons. The machinery (cylinders 16 in., 26 in., and 43 in. by 30-in. stroke) is being supplied by the company's St. Peter's Engine Works. The vessel was named the *Chater-dag*.

Jubilee.—On March 19th a new steam yacht, for service between Barmouth and Penmaenpool, on the River Mawddach, was launched at Birkenhead. She is named the *Jubilee*, and takes the place of a smaller yacht which has been in the above service for some years, but which has now been transferred to Bangor, for service at Garth Ferry. The new *Jubilee* is 63 ft. long, by 12 ft. beam, and has been built under Board of Trade survey by Messrs. Cochran & Co., Birkenhead, for Captain Griffith, of Barmouth.

LAUNCHES.—SCOTCH.

Indraghiri.—On March 5th, a steel schooner-rigged steamer of about 4,596 tons, named the *Indraghiri*, was launched at Glasgow. Owned by Mr. T. B. Royden, of Liverpool.

Westfield.—On February 19th there was launched by Messrs. Russell & Co., of Port-Glasgow, a steel four-masted barquentine, built to the order of Messrs. James Nicoll & Co., ship and insurance brokers, Dundee. The vessel was named the *Westfield*. Her dimensions are: 210 ft. by 35 ft. 6 in., by 19 ft. 6 in. Her register tonnage is 1,020, while her deadweight carrying capacity is 1,800 tons.

Giavota.—On February 25th Messrs. A. Rodger & Co., shipbuilders, Port-Glasgow, launched a twin-screw awning-deck steamer, to the order of the Amazon Steam Navigation Co., Limited, London. The dimensions are:—Length 120 ft.; breadth, 22 ft. 6 in.; depth, 8 ft. 9 in. This steamer is intended for passenger traffic on the river Amazon, and will be supplied with engines by Messrs. Rankin & Blackmore, Greenock. She was named *Giavota*.

Skomer.—On February 27th the *Skomer*, an iron steamer of about 151 tons gross, was launched at Aberdeen. Owned by Messrs. Neale & West, Cardiff.

Polycarp.—On February 28th Messrs. Barclay, Curle & Co., Limited, launched from Clydeholm Shipbuilding Yard, Whiteinch, a steel screw steamer built to the order of Messrs. Alfred Booth & Co., Liverpool. The vessel (sister ship to the s.s. *Dominic* and s.s. *Dunstan*, constructed by the builders for the same owners) is built to Lloyd's 100 A1 spar-deck class, and will be furnished with every modern requisite to facilitate the working of the ship and the loading and discharging of cargo. The vessel is to be completely lit up with electric light, and is fitted with telescopic masts for service on the Manchester Canal. While under construction the vessel was superintended by Messrs. Garland & Beckett. Her dimensions are—322 ft. by 42 ft. by 28 ft., and will carry about 4,600 tons deadweight. On moving on the ways the vessel was named the *Polycarp* by Miss Constance Booth, of Liverpool, and afterwards proceeded to the crane to receive her engines, which are on the triple-expansion principle, developing about 1,700 H.P., and which will be supplied by the builders.

Vingard.—On March 2nd the *Vingard*, a steel steamer of about 125 tons gross, was launched at Aberdeen. Owned by the Tullos & Foyers Steamship Co., Aberdeen.

Smiling Morn.—On March 2nd the *Smiling Morn*, a steel steamer of about 125 tons gross, was launched at Aberdeen. Owned by the Tullos & Foyers Steamship Co., Aberdeen.

Bellasco.—On March 2nd Messrs. David and William Henderson & Co. launched from their yard at Partick a handsomely-modelled steel-screw steamer named the *Bellasco*, which they have built to the order of Messrs. Bell Bros. & M'Lelland, of Glasgow. This vessel is a duplicate of the *Bellailsa*, lately launched by this firm for the same owners, and is of the following dimensions:—Length, 350 ft.; breadth, 45 ft.; depth, 28½ ft.; gross tonnage, about 3,800 tons. The *Bellasco* has been built under the special survey of the British Corporation for the highest class in their registry, B.S. The double bottom is fitted for water ballast fore and aft, and the aft-peak for use as a trimming tank. There are two complete steel decks, and the upper deck is sheathed with pine. The erections consist of a poop, bridge, and forecastle. The accommodation for passengers, officers, and engineers is in houses on the bridge deck. The saloon is handsomely finished in houses polished hardwood, and all the state-rooms and officers' rooms are of large size and very completely furnished. A large teak house is fitted on the top of the saloon-house, containing chart-room and wheel-house. The upper navigating bridge is on the top of this. The crew are berthed on the topgallant forecastle, which also contains their wash-houses, store-rooms, &c. The cargo gear is of the most complete description, including seven large steam winches and double derricks at each hatch, capable of lifting weights up to five tons. The masts are telescopic, to render the vessel suitable for the Manchester Ship Canal. The outfit includes steam steering gear by Caldwell & Co., steam windlass by Clarke, Chapman & Co., and Chadburn's steering and engine telegraphs, &c. The machinery has been constructed by the builders' firm. It consists of a set of triple-expansion engines, with cylinders 24 in., 40 in., and 66 in diameter respectively, by 48 in. stroke, and is suited for a working pressure of 165 lbs. Steam is supplied by two large single-ended boilers fitted with Howden's system of forced draught. During construction the hull and machinery have been under the personal supervision of Mr. P. Gifford, the owners' superintendent. This is the eleventh vessel Messrs. D. & W. Henderson & Co. have built for Messrs. Bell Bros. & M'Lelland. As the *Bellasco* left the ways she was gracefully named by Miss Kitty M'Lelland, daughter of Mr. Robert M'Lelland, Montgomerie Quadrant, Kelvinside.

Pendeen.—On March 3rd Messrs. A. Rodger & Co. launched at Port-Glasgow a full-rigged ship of 1,800 tons net register, and of 3,300 tons deadweight carrying capacity, her dimensions being:—Length, 266 ft.; breadth, 40 ft.; depth, 23 ft. 6 in. She has been built to the order of Messrs. C. Gordon Cowan & Co., Greenock, and on leaving the ways was named *Pendeen*.

Prometheus.—On March 3rd Messrs. Scott & Co., Greenock, launched a steel screw steamer named *Prometheus* for the Ocean Steamship Co., Liverpool. Dimensions:—Length, 422 ft.: breadth, 49 ft.; depth, 31½ ft.; of 5,200 tons gross, and 7,200 tons carrying capacity. The builders will supply triple-expansion engines of 3,500 I.H.P., the diameter of cylinders being 29 in., 50 in., and 82 in., with 5 ft. piston stroke; and the working pressure will be 180 lbs. to the square inch. The *Prometheus* is furnished with all the latest improvements for facilitating the loading and discharging of cargo, her equipment comprising 14 steam winches and 25 cargo derricks, one being able to lift 35 tons, and the remainder from five to 20 tons. The sister ship of the *Prometheus* will be ready for launching next month.

Carlow.—On March 3rd Messrs. Blackwood & Gordon, engineers and shipbuilders, launched from their building yard at Port-Glasgow a handsome steel screw-steamer for service in the cross-Channel trade between Ireland and England. This steamer has been built to the order of the City of Dublin Steam Packet Co. of Dublin for their Dublin and Liverpool trade, and is built on similar lines to the fine steamers *Louth* and *Wicklow*, also constructed by Messrs. Blackwood & Gordon for the same owners, which vessels have become prime favourites with the travelling public and also owners of cattle. On leaving the ways the vessel was named *Carlow* by Mrs. Bell, wife of Captain George R. Bell, R.N., marine superintendent of the company at Liverpool, and was afterwards taken into the builders' wet dock within their works to receive her machinery, which has also been constructed by the builders. Her dimensions are:—Length, 260 ft.; breadth, 34 ft.; depth, 16 ft. 9 in.; with long poop bridge, and forecastle and short wells filled in, and having a tonnage of 1,250 tons gross register; engines of the triple-expansion type, with bronze propeller and large boilers working up to fully 3,000 H.P. The hull of the vessel has been built very much in excess of the requirements of Lloyd's class, and is fitted with powerful steam windlass, steam steering gear, steam winches, &c. In the holds, 'tween and main decks, fittings are arranged for 500 cattle, and on the upper deck sheep fittings are arranged. Efficient ventilation by means of fans and ventilators has been provided, so as to ensure the safe and comfortable transit of cattle between the Irish and English ports, special attention being given to this very important matter by the builders in accordance with the views of the managing directors, and in compliance with the new Orders in Council regarding cattle transit. In the forward part of the vessel a large and commodious covered-in steerage has been arranged for the use of third-class passengers and also a large and well-ventilated cabin for the exclusive use of cattle dealers. In the afterpart of the vessel a large house on poop deck has been fitted with private cabins for the accommodation of 30 first-class passengers, and entering from this house is the main saloon, having accommodation for other 70 passengers, making 100 in all. The saloons are handsomely fitted up and upholstered in velvet, and electric light is fitted throughout. In the centre of the vessel on the bridge deck a pleasant smoking-room is arranged, over which a teak house is fitted, with rooms for the captain and chief officer. Above this house is placed the flying bridge, from which, on account of its height, the officer on watch will be able to keep a good look-out. The *Carlow* is an improvement on her sister ships *Louth* and *Wicklow* in having accommodation for 30 additional first-class passengers provided in private cabins on the poop deck, and in the coming summer we have no doubt this new departure on the part of her owners will be appreciated and taken advantage of by the travelling public. During construction the *Carlow* has been inspected by Mr. Ferber, the engineering superintendent of the City of Dublin Steam Packet Co., and he has spared no pains in his efforts to obtain for his owners a vessel that will suit the requirements of their trade. After the launch, the company met in the model-room, where luncheon was served. Amongst those present were—Mr. and Mrs. D. B. M'Geoch, Mr. and Mrs. F. P. Purvis, Mr. Edward Watson, director of the company; Captain George Bell and Mrs. Bell, Liverpool; the Rev. W. W. and Mrs. Beveridge, Rev. C. Coddington, Greenock; Mrs. Kelly, Port Glasgow; Mr. John Hope, Port-Glasgow; Mr. L. Neilson, Glasgow; Mr. Ferber, superintending engineer of the company, and others.

Honolulu.—On March 4th Messrs. Robert Duncan & Co., Limited, Port-Glasgow, launched from their shipbuilding yard the largest steel fore-and-aft sailing schooner ever built in this country, and of a type rarely met with unless on the Pacific coast, the proportions being so extreme as compared with the form of sailing vessels built in these times. The dimensions are:—225 ft. over all, by 42 ft. by 18 ft. 6 in. hold, the dead rise of floor being about 6 ft., giving a co-efficient of form as fine as that of the famous tea clippers built in our midst in the "fifties," and which made for themselves a world-renowned reputation for "record-breaking" voyages to and from the Far East. The structure of the vessel is of the strongest description for the safe carrying of heavy timber cargoes, somewhere about 1¼ millions superficial feet of lumber being her complement. The main deck from stem to stern is entirely of steel, with strong bulwarks supported by heavy bulk web stanchions every 4 ft. apart, in order to ensure safety in carrying the immense deckloads so prevalent in the particular trade for which the vessel is intended. The forecastle deck is also of steel, while the large poop deck presents an uncommon feature, being completely laid with Oregon pine, every plank of which runs the entire length of the deck, and without a single knot. A very powerful steam winch and multitubular boiler, sent all the way from the works of Murray Bros., San Francisco, are fitted in the after part of the deckhouse, with every appliance and gearing for rapidly hoisting and working the immense fore-and-aft sails, and for loading and discharging deckloads of heavy timber. In case of need steam can be raised on this boiler in about ten minutes to a pressure of 200 lbs. per square inch, which is of great advantage where all the spars, sails, and gear are of the heaviest description. A powerful steam windlass of Emerson & Walker's most improved type is fitted on the main deck under the forecastle deck for the speedy working of the anchors and cables, as also one of Tangye's patent duplex steam pumps, capable of throwing over 2,000 gallons of water per hour, which appliance will be most invaluable in the case of fire or other accidents to the vessel or cargo. A set of Mills's patent pumps is fitted amidships, which can be worked by means of messenger chains from the steam winch. Besides having unusually large hatchways for timber cargoes, there are fitted in the bow and stern large ports capable of taking in the heaviest of timber of almost any length, the timber being put on board by an ingenious arrangement of leads and pulleys worked from the steam winch on deck. When fully rigged and completed this craft will present a novel and interesting sight, having four huge masts of steel, each in one length from keel to truck, and about 140 ft. long, to which will be attached heavy booms and gaffs to take the vast spread of canvas necessary to drive the vessel along, the sail area being considerably greater in proportion to the displacement than that of any square-rigged vessel afloat. As already mentioned, these sails will all be handled by gear direct from the steam winch, which will be a considerable relief to the crew. The entire outfit of blocks in connection with the vessel is of a special and most expensive description, having been made by Messrs. Laird & Sons, Irvine, from designs and particulars supplied by the owner, and specially adapted for the excessively hard work they have to stand. The gigantic sails, which are of the heaviest Massachusetts cotton canvas, have been made by Messrs. Ferguson, of Greenock. The running rigging, ropes, and hawsers are of the best Manilla hemp, and have been made and supplied by Messrs. Orr, Hunter & Co., Greenock. The standing rigging, which is exceptionally heavy, is made of the best Siemens-Martin galvanised steel-wire rope, and has been supplied by the Whitecross Co., of Warrington; and the large towing and mooring hawsers, of the finest crucible steel-wire rope, fitted on malleable-iron purchase winches, have all been provided by Messrs. Hebster & Co., of Sunderland. One of M'Gregor's patent standard compasses, having azimuth arrangements, together with a Ritchie's (of Boston) spirit steering compass, will be placed on the poop. The rudder is of a design supplied by the owner, and which is seldom seen in large sailing vessels in these waters, being abnormally broad at the bottom, tapering to nothing at the load-line, for the purpose of manœuvring the ship quickly when going through the narrow channels among the Sandwich Islands. The rudder will be worked by one of M'Bryde's double-screw steering gears fitted on the poop. Under the poop deck is fitted the accommodation for captain and officers, and is composed of main saloon, captain's saloon, captain's state-room, two spare state-rooms, first and second mates' rooms, steward's room; also pantry, w.c., bath-room, store-rooms, &c. The saloons and state-rooms will be all handsomely upholstered in morocco leather. We may here mention that the petty officers and seamen are accommodated in a large deck-house forward, where every convenience is provided for their comfort. The vessel, which is classed "British Standard" with the British Corporation of Shipping, Glasgow, is owned by Mr. John Ena, merchant and shipowner, Honolulu (for whom Messrs. Duncan built the large sailing ship *John Ena* in 1892), and was built under the superintendence of Captain William Thonagel, of San Francisco, who has had great experience and is well known in the Pacific trade. The vessel was named *Honolulu* as she glided from the ways, afterwards being towed to Greenock to be masted, after which she will proceed to Glasgow to load a general cargo for Valparaiso.

Southend Belle.—On March 11th Messrs. William Denny & Bros., Leven shipyard, Dumbarton, launched a steel paddle-steamer of the following dimensions, viz.:—249 ft. long, 30 ft. broad, 10 ft. 6 in. deep, and about 700 tons gross register. She has been built to the order of the London, Woolwich, and Clacton-on-Sea Steamboat Co.—now the Belle Steamers, Limited—for their fast passenger service between London and the lower reaches of the Thames. The vessel when leaving the ways was named the *Southend Belle* by Miss Spence, daughter of Mr. Horace R. Spence, secretary of the company. The *Southend Belle* is the fourth steamer built by Messrs. Denny for this company, the previous steamers being the *Clacton Belle*, the *Woolwich Belle*, and the *London Belle*. All these vessels are fitted up in the highest style, with every modern improvement for the comfort of the travelling public. The machinery will be supplied by Messrs. Denny & Co., Dumbarton.

Eclipse and **Equity.**—On March 12th Messrs. Mackie & Thomson launched from their yard at Govan two steel screw fleeters, named the *Eclipse* and the *Equity*, which they have built for the Great Northern Steam Fishing Co., Limited, Hull. The dimensions of each are:—Length, 103 ft. 6 in.; breadth, 20 ft. 6 in.; depth, 11 ft. 7 in.; and gross tonnage, 160 tons. The engines, which are by Messrs. Muir & Houston, Kinning Park, are triple-expansion, with cylinders of 11 in., 17 in., and 28 in. diameter respectively, by 20in. stroke, and adapted to work at a pressure of 160 lbs. The christening was conducted in the case of the *Eclipse* by Miss Laidlaw, Pollokshields, and Miss Mattie Houston, Dumbreck House, Ibrox; and in the case of the *Equity* by Mrs. Hayworth, Hull, and Miss Baines, Hull. The vessels are the twelfth and thirteenth which Messrs. Mackie & Thomson have built for the same owners.

Tartar.—On March 14th Messrs. Scott & Sons launched from their shipbuilding yard at Bowling a screw steamer of dimensions 130 ft. by 22 ft. by 10 ft., built to the order of Messrs. Robert Walker & Co., Clyde Terrace, Glasgow, for their fish-carrying trade. Compound surface condensing engines of large power will be fitted on board by Messrs. Muir & Houston, Limited, Kinning Park, Glasgow. On moving down the ways the steamer was named *Tartar* by Miss Muriel Gibb, 10, Granby Terrace, Hillhead, Glasgow.

Lynrowan.—On March 14th Messrs. William Hamilton & Co. launched from their Glen Yard, Port-Glasgow, a steel screw steamer of 2,900 tons register, to carry 4,300 tons deadweight, for the Liverpool Shipping Co., of Liverpool, the managers being Messrs. Johnston, Sproule & Co., of that city. The vessel is intended for their Eastern and general trade. The following are the principal dimensions:—Length between perpendiculars, 310 ft.; breadth, 42 ft. 6 in.; depth, moulded to main deck, 21 ft. 9 in. The vessel has been built to the highest class at Lloyd's, partial awning deck type, on the deep frame system, and is fitted throughout with a double cellular bottom for water ballast. All the newest requirements for the quick loading and discharging and working of the ship have been supplied, including steam windlass, steam steering-gear, steam winches, and large fresh water condenser, and tanks for use when carrying cattle. The holds are arranged so that shifting boards and feeders in 'tween decks can be easily fitted for carrying grain in bulk. The vessel is schooner rigged, and the topmasts are made to telescope, so that the vessel can pass under the bridges on the Manchester Canal. The accommodation for the officers and crew are of the most complete description, the captain and officers being placed in large house on awning deck amidships, the engineers in houses alongside engine casing, while the crew are placed forward on the main deck. The machinery, which is being supplied by Messrs. D. Rowan & Son, Glasgow, is on the triple-expansion system. The cylinders are 22 in., 36 in., and 60 in., by 42 in. stroke, steam being supplied by two large boilers working at 160 lbs. pressure. As the vessel left the ways she was gracefully named *Lynrowan* by Miss Campbell. The managing owners were represented by Mr. H. C. Ashlin, of Messrs. Ashlin & Co., consulting engineers and naval architects, of Liverpool and London, who have superintended the building of both hull and machinery.

Steam Hopper Barge.—On March 17th Messrs. Wm. Simons & Co., Limited, Renfrew, launched the first of three steam hopper barges recently ordered from them by the Admiralty for service at Devonport. The dimensions are as follows:—Length, 160 ft.; breadth, 28 ft. 6 in.; depth 12 ft. 6 in. The vessel is capable of carrying 570 tons deadweight, and is propelled by one pair of compound surface condensing engines of I.H.P. sufficient to propel the vessel when fully loaded at a speed of about 9 knots per hour. There were present at the launch Her Majesty's surveyors, Messrs. Hay & Scoggins, under whose direction the vessel was built. The berth in the yard will be occupied by a large and powerful stationary barge loading dredger, recently ordered by the Mersey Docks and Harbour Board.

St. Vincent.—On March 17th Messrs. Robert Napier & Sons, Limited, launched at Govan the *St. Vincent*, a steel screw steamer of 1,000 tons, which they have built to the order of the Glasgow Shipowners' Co. The general dimensions are:—Length, 260 ft.; breadth, 37 ft.; and depth, 20 ft. 6 in. The vessel, which will be supplied with triple-expansion engines by Messrs. Muir & Houston, Kinning Park, is intended for the owners' general cargo trade.

Sir Evelyn Wood.—On March 17th Messrs. Fleming & Ferguson, Limited, shipbuilders and engineers, Paisley, launched from their Merksworth yard the steel screw steamer *Sir Evelyn Wood*, built to the order of the British Government. The dimensions of the vessel are 160 ft. by 24 ft. by 14 ft. moulded. The *Sir Evelyn Wood* is intended for the transport of heavy ordnance, and to meet the requirements of this work has been built with specially heavy scantlings. Machinery for the vessel will be supplied and fitted by the builders.

Margarita.—On March 19th Messrs. Blackwood & Gordon, engineers and shipbuilders, Port-Glasgow, launched a handsome steel paddle passenger steamer, built by them for Messrs. The Algeciras (Gibraltar) Railway Co., Limited, London, for service between Algeciras, Gibralter, Tangiers, and Ceuta. The vessel has been built under the inspection and to the requirements of Board of Trade and Lloyd's. The dimensions are:—Length over all, 137 ft.; breadth, 20 ft.; depth, moulded, 8 ft. 1 in. After the launch the vessel was towed into the builders' dock to receive her machinery, which is of the diagonal compound surface-condensing type, with large tubular boiler, 110 lbs. working pressure. The vessel on leaving the ways was named *Margarita*, by Miss Aline Purvis, daughter of F. P. Purvis, Esq., one of the partners of the firm. The vessel has been built to plans and under the superintendence of Mr. F. J. Trewent, naval architect, London.

Indravati.—On March 19th there was launched at Troon, by the Ailsa Shipbuilding Co., a handsomely modelled steel screw steamer, 212 ft. long by 31 ft. beam by 13 ft. 7 in. depth, moulded to main deck. She is owned by Messrs. Shepherd & Co., of Bombay, and is to be employed in their Indian coasting passenger and cargo trade, for which she is fitted with the most recent appliances, including a complete installation of electric light throughout the ship, and six hydraulic cranes. Messrs. Dunsmuir & Jackson will fit the machinery, which is to be triple-expansion, working under a pressure of 200 lbs. She was christened the *Indravati* by Mrs. Jackson, Westbourne Terrace, Kelvinside.

Jupiter.—On Saturday, March 21st, Messrs. James & George Thomson, Limited, Clydebank, launched a handsome paddle-steamer, which has been built to the order of the Glasgow and South-Western Railway Co. This is the fourth steamer built by the Clydebank Co. for the same owners within the last few years, and, although having only one funnel and not being so large as the popular *Glen Sannox*, her general appearance will be similar to that vessel. A main feature of the vessel will be the promenade deck, which extends from stem to stern, while forward the plating has been carried up to the promenade deck, which should make the vessel a comfortable rough-weather boat. All the usual auxiliary machinery has been provided, including electric light throughout, and from the smart appearance of the vessel no doubt she will be able to hold her own on the Clyde this season. Captain Alexander Williamson and Mr. Robert Morton superintended the construction. The name *Jupiter* was conferred by Miss Jessie Watson, of Hawick.

Pointer.—On Saturday afternoon, March 21st, Messrs. A. & J. Inglis launched from Pointhouse Shipbuilding Yard a fine steamer of 1,200 tons for Messrs. G. and J. Burns's Glasgow and Liverpool service. This vessel is similar to the *Spaniel*, built by the same firm last year, and already favourably known to passengers by that route. On leaving the ways the new steamer was named the *Pointer* by Master Edwyn O. Inglis.

LAUNCHES.—Irish.

Ivan.—Messrs. Harland & Wolff launched in Belfast lately the large twin-screw steamer *Ivan*, for Messrs. Edward Bates & Sons. She is intended for their Eastern trade. This vessel is 452 ft. in length, with tonnage of about 6,100; will have four pole masts, fore-and-aft rigged, and be fitted with the most approved appliances for working the ship and cargo, also with complete installation of electric light. Her propelling machinery consists of two sets of triple-expansion engines, constructed by the builders. The owners were represented by Mr. Glover, their marine superintendent.

Langton Grange.—On February 29th Messrs. Workman, Clark & Co. launched at Belfast a large steel screw steamer, named the *Langton Grange*, built to the order of Messrs. Houlder Brothers & Co., of London, Liverpool, Glasgow, Buenos Ayres, and Rosario. The principal dimensions of the vessel are:—Length, 420 ft.; breadth, moulded, 54 ft.; depth, moulded, 32 ft.; with a gross tonnage of over 5,800 tons. The *Langton Grange* has been specially designed to suit the requirements of the owners' trade with Australia, the Cape, and the River Plate. She has been built to Lloyd's highest class, 100 A1, three-deck rule. The machinery consists of triple-expansion engines capable of developing a H.P. of about 2,800. Steam will be supplied from three single-ended boilers at a working pressure of 180 lbs., fitted with Howden's forced draught.

Istrar.—On Saturday, March 14th, Messrs. Harland & Wolff, Belfast, launched the large screw steamer, *Istrar*, for Messrs. Edward Bates & Sons. This vessel, which is intended for their Eastern trade, is 400 ft. in length, with a tonnage of about 4,600. She will have two pole masts, and be fitted with all the most approved appliances for the working of ship and cargo, as well as with complete installation of the electric light. She is supplied with a set of powerful triple-expansion engines, constructed by the builders of the vessel.

Lord Dufferin.—On March 19th Messrs. Workman, Clark & Co. launched, at Belfast, a steel sailing barque, built to the order of Messrs. J. Herron & Co., of Liverpool. The dimensions of the vessel are:—Length, 28¼ ft.; breadth, 42 ft.; depth of hold, 24 5 ft.; with a gross tonnage of about 2,250 tons. She has been built to Lloyd's requirements for their highest class, and was named *Lord Dufferin* by Miss Young.

LAUNCH.—German.

Twin-screw Steamer.—On February 15th the Flensburg Shipbuilding Co. launched a twin-screw steamer, for the Hamburg Calcutta Line. Her dimensions are:—420 ft. by 50 ft. by 33 ft. Two engines, each 900 H.P., are constructed for this vessel by the Flensburg Shipbuilding Co.

TRIAL TRIPS.

Bellailsa.—On February 1st the steamship *Bellailsa*, 3,800 tons gross, built and engined by Messrs. David and William Henderson & Co., Partick, went down the river, and in the course of the day ran a series of trials on the measured mile, the mean speed attained being fully 12½ knots, a result which gave entire satisfaction to all concerned. During the day the machinery worked smoothly and without a hitch. The owners were represented by Messrs. M'Lelland & Mann, assisted by Mr. Paterson Gifford, their superintendent engineer, whilst the builders were represented by Messrs. John Henderson and A. P. Henderson. In the course of the evening the vessel returned to Glasgow to complete her loading for the West Coast of South America.

Calais.—On February 11th the new paddle steamer *Calais*, built by Messrs. William Denny & Brothers, and engined by Messrs. Denny & Co., Dumbarton, for the London, Chatham, & Dover Railway Co., went on her trials between the Cloch and Cumbrae Lights. The *Calais* is a sister vessel to the *Dover*, built by the same firm fully a month ago, and is intended for the cross-Channel service between Dover and Calais. Both these vessels embody in their design the results of their builders' extensive experience of Channel steamers, as well as information derived from their experimental tank. The principal dimensions are:—Length, between perpendiculars, 280 ft.; breadth, moulded, 35 ft.; depth to promenade deck, 22 ft. 3 in., with a gross tonnage of 979. She is built of steel throughout, and is subdivided into nine watertight compartments by means of bulkheads extending to main deck. There is a complete promenade deck extending the full breadth of the vessel, forming a roomy and comfortable promenade for passengers in fine weather and an effectual shelter against storm or rain. The propelling machinery, which has been constructed by Messrs. Denny & Co., consists of a set of triple-expansion, diagonal engines, supplied with steam by four tubular boilers, at a working pressure of 150 lbs. per square inch. The cylinders have cast steel pistons, and forged steel piston rods. The high and intermediate pressure cylinders are fitted with piston valves, while the valve on the low-pressure cylinder is of the usual double-ported type, with an equilibrium ring on the back. The connecting rods, caps, and bolts are of ingot steel, and the crank pin brasses are lined with white metal. The valve gear is of Mr. Brock's special design, with cast steel rocking quadrant, arranged so as to keep the lead constant for all grades of expansion. All the shafting is of ingot steel. At the trials the owners were represented by Captain Morgan, R.N. (superintendent of the company), Mr. Kirtley (engineering superintendent), and Messrs. Messenger and Murch (assistants of Captain Morgan). The builders and engineers were represented by Mr. James Denny, Colonel Archibald Denny, and Mr. R. B. Pope. Amongst others present were Mr. W. G. Robson, Mr. Campbell (of the Board of Trade), Mr. Stark (of Messrs. Patrick Henderson & Co.), &c. The *Calais*, on the measured mile the other day, attained a speed of 19·65, which was slightly better than the *Dover*; whilst on February 11th the mean of her four runs was 19·37, whilst the *Dover* on the same runs attained a speed of 19 36. It is seldom indeed that two vessels the same in every respect come so near each other in their trial runs. It is worthy of note that the *Dover* for a month's running on her station, and taking weather and tides as they have come, has developed a mean speed of 18·6 knots per hour.

Kingtor.—On Monday morning, February 24th, the s.s. *Kingtor*, just completed by Messrs. Ropner & Son, of Stockton-on-Tees, to the order of Messrs. J. Holman & Sons, of London, left the River Tees for her official trial trip. The steamer's compasses were duly adjusted on her arrival in the Tees Bay, Afterwards a very satisfactory run was made, resulting in a speed of from 10½ to 11 knots, the engines working very satisfactorily, and without a hitch of any kind: the boilers at the same time maintaining an ample supply of steam with ordinary firing. Mr. R. H. Holman, and Captain A. C. Holman, of London, were present at the trip, the latter gentleman having superintended the vessel during construction, whilst Messrs E. J. Caiger & Co., of London, have taken the overlook of machinery department. Mr. R. Ropner, jun., who represented the shipbuilders, was also present at the trial. After a very satisfactory and pleasant run, the steamer proceeded on her way to Cardiff, where she will load for the Black Sea.

Folsjo.—On February 25th the large new steel screw steamer *Folsjo*, built by Messrs. Wood, Skinner & Co., of Bill-Quay-on-Tyne, to the order of Mr. Alf. Monsen, of Tonsberg, Norway, left the Tyne for her trial trip. The vessel is a fine specimen of a cargo steamer, designed to carry 2,300 tons deadweight on a light draught. She is of the long-raised quarter-deck type, with extended bridge and topgallant forecastle, and is rigged as a fore-and-aft schooner, with fidded topmasts. Water ballast is provided in the cellular double bottom all fore and aft, and the vessel is fitted with all the most recent improvements and appliances for facilitating the rapid loading and discharging of cargo. The principal dimensions of the vessel are as follows:—Length over all, 264 ft.; beam, 36 ft.; depth, moulded, 18 ft.: and she has been constructed under special survey for Norwegian Veritas highest classification. The engines, which have been built and fitted by the North-Eastern Marine Engineering Co., Limited, of Wallsend, are of the triple-expansion type, having cylinders 18½ in., 30 in., and 49 in. by 33-in. stroke. During the trial the ship attained a highly satisfactory average speed, the machinery working without the slightest hitch, the owner and all on board expressing themselves as being very much pleased with the vessel generally and the results obtained. Immediately after the trial trip the steamer proceeded on her first voyage to Gothenburg to load for the River Plate.

Fau Sang.—On Tuesday, February 25th the s.s. *Fau Sang*, which has been constructed by Messrs. Wigham Richardson & Co., to the order of the Indo-China Steam Navigation Co., Limited, of London, went for a very successful trial trip off the mouth of the Tyne. The steamer is built of steel, and of a fine model. She is 290 ft. in length by 40 ft. beam by 25 ft. depth, and is rigged as a two-masted schooner. She is very completely equipped for her special trade in the East, having all the most modern and improved appliances for working both the cargo and the ship with both despatch and economy. She has also comfortable accommodation for a few European passengers and a large number of native passengers. The engines and boilers have also been constructed by Messrs. Wigham Richardson & Co., and they have been designed to enable the vessel to maintain a good speed on her service. On the trial trip the machinery worked without the slightest hitch, giving the greatest satisfaction to all concerned, and propelling the vessel at a mean speed of 11½ knots. On the trial trip the owners were represented by Mr. Cheyne, the secretary of the company, Mr. Buchanan, their superintendent engineer, who has superintended the construction of the vessel assisted by Mr. Duncan.

Treasury.—On February 27th the s.s. *Treasury*, built by Palmers' Shipbuilding and Iron Co., Limited, to the order of Messrs. Wm. Thomas & Co., Liverpool, was taken to sea for her official steam trials. Her dimensions are as follows, viz.:—Length between perpendiculars, 325 ft.; beam, 43 ft.; depth, moulded, 21 ft. 6 in.; and she is built under special survey to Lloyd's highest class. She has partial awning deck extending from the stern to the mainmast, accommodation for the engineers being provided in the 'tween decks at sides of engine-casing. The hull is built on the web-frame principle, with cellular double bottom throughout, except in the engine and boiler space, and is fitted with five powerful steam winches and large donkey boiler, patent direct-acting steam windlass, by Emerson, Walker & Co., and steam warping capstan, her two topmasts being telescopic; large hatchways, double derricks, shifting boards, combined hand and steam steering gear amidships, and screw steering gear aft, and all modern gear for rapid loading and discharging of cargo. The saloon and officers' cabins are aft in a sunk poop, and crew accommodation in the 'tween decks forward. The engines and boilers are also built by the Palmer Co., having cylinders 22½ in. by 36½ in. and 61 in. by 42 in. stroke, and two boilers 14 ft. 6 in. by 10 ft., working at a pressure of 160 lbs. During the trial the engines worked in a highly satisfactory manner, and a mean speed of 10·65 knots was attained on the measured mile. The vessel is designed to carry 4,400 tons deadweight cargo on a draught not exceeding 20 ft., and has been built under the personal supervision of Capt. Williams, of Liverpool.

Tropic.—On Saturday, February 29th, the s.s. *Tropic*, built by the Tyne Iron Shipbuilding Co., Limited, of Willington-Quay-on-Tyne, for E. C. Thin, of Liverpool, went her trial trip. This steamer has been specially designed to meet the modern demand for high-class light draught steamers, and carries a large deadweight on moderate draught. She is 350 ft. by 47 ft. by 28 ft. 3 in. moulded, and has powerful engines 25½ in., 41 in. and 68 in. by 48 in. stroke, supplied by the North-Eastern Marine Engineering Co., Limited, of Wallsend-on-Tyne. The vessel has three high-pressure multitubular boilers, so as to give her a good rate of speed, and on her trial trip she attained a speed of 12½ knots on the run between Tynemouth and Newbiggin, and afterwards proceeded on her voyage. During construction the vessel has been under the supervision of Captain George Lodge, the owners' representative, and Messrs. Irwin, Atkinson & Young, of Liverpool and London.

Greylands.—On March 3rd the s.s. *Greylands*, a fine steel screw steamer, built by Messrs. William Gray & Co., Limited, for Messrs. Robert Hardy & Co., of West Hartlepool, left that port for her trial trip. The vessel has been built to Lloyd's highest class, and is of the following dimensions:—Length over all, 324 ft.; breadth, 44 ft.; and depth, 23 ft. 3 in.; deadweight, over 4,100 tons on a draught of about 19 ft. The deck erections consist of a poop, bridge over machinery space, and top-gallant forecastle. A handsome saloon, and cabins for officers, &c., are fitted in the poop, the engineers' rooms are in the bridge, and the crew's accommodation forward. The hull is built on the web-frame system, with a cellular double bottom, large hatchways, powerful steam winches, steam steering gear amidships, hand screw gear aft, patent donkey boiler, patent direct steam windlass, boats on beams overhead, shifting boards throughout, stockless anchors, two masts with schooner rig, and a complete outfit for a first-class cargo vessel. The engines are of the Central Marine Engine Works' well known triple-expansion type, having cylinders 23 in., 36 in., and 62 in. in diameter, with a piston stroke of 39 in., and are supplied with steam by two large boilers working at a pressure of 160 lbs. per square inch. After some hours' manœuvring in the bay, the vessel was brought to off the headland to receive a party of inspecting engineers and visitors, amongst whom were Mr. Robert Hardy (managing owner), Mr. Gates (inspecting engineer for the company), Mr. Matthew Harrison, Mr. C. A. Forslind, Mr. Chalton, Mr. Jacob Hessler, Mr. Joseph Merryweather, Captain Bacon, and Captains T. and W. Watson, visitors; Captain Murrell, on behalf of the shipbuilders; and Mr. Lindsay, representing the engine builders. The engines were now put full speed ahead with the log overboard, when it was found that the vessel averaged a speed of 11 knots. The engines ran with perfect smoothness and without a hitch, the trial being in every respect a highly satisfactory one. The *Greylands* proceeded direct to Tyne Dock, where her visitors were put ashore, and the vessel will load for Genoa.

Douro.—On March 5th the trial trip of the twin-screw passenger steamer *Douro* took place on the river Ribble. The vessel is fitted out for passenger service on the river Amazon, and is also fitted out with electric light and a powerful search-light. On a mean draught of 4 ft. 6 in. the speed obtained was 11 knots, the weather at the time being most unsuitable for the trial trip of a steamer having three decks and on such a shallow draught, it blowing a gale of wind all the time, but in spite of this the vessel behaved herself in every way satisfactory. She sailed for Para on the 9th, and is expected out there in about twenty days. Length between perpendiculars, 120 ft.; beam, 26 ft.; depth, 6 ft. 6 in. at middle.

Huascar.—On Saturday, March 7th, the s.s. *Huascar*, built by the Sunderland Shipbuilding Co., Limited, for Monsieur Mourraille, of Iquitos, was taken to sea for her official trial trip. The dimensions of the vessel are—215 ft. b.ps., by 31 ft. breadth, by 15 ft. 6 in. depth; classed 100 A1 Lloyd's, under special survey, having long poop with promenade deck above. The captain, officers and engineers are all berthed amidships, and the crew in the forecastle. Accommodation for 16 first-class passengers is in a house built on promenade deck, and for 16 second-class under the promenade deck aft. The engines are by Messrs. The North-Eastern Marine Engineering Co., Limited, of Sunderland, and have cylinders 16 in., 26 in., and 43 in., by 30 in. stroke, 180 lbs. working pressure, and include all the latest improvements. The trial was most satisfactory, the machinery working without a hitch. The mean speed obtained was 11·9 knots. As soon as the trial was finished she proceeded on her voyage. This steamer has been specially constructed to carry 1,100 tons on 13 ft. 8 in. draught, and on the net tonnage of 530. The hull and engines during their construction have been under the direct personal supervision of Captain James Good, of Liverpool.

Australian.—On March 11th the new steamship *Australian*, built by Messrs. R. Napier & Sons, Limited, for the Eastern and Australian Steamship Co., London, had a very successful trial on the Firth of Clyde, when all the conditions of the contract were fully implemented. The *Australian* has been specially designed for the company's important service between

Australia, China, and Japan, and is fitted with the most modern appliances for the comfort of the passengers and the efficient working of the ship and rapid handling of cargo, including a very complete installation of electric lighting, and refrigerating machinery and chambers for the transport of frozen meat, &c. The general dimensions are:—Length, 340 ft.; breadth, 42 ft.: depth, 25 ft., with a gross tonnage of 2,840, and a top-gallant forecastle, long bridge, and full poop. The hull and machinery have been constructed under special survey to the highest class at Lloyd's and in accordance with the Board of Trade requirements for passenger steamers. As the vessel is intended to be employed in tropical climates the passenger accommodation has been placed on the upper deck, which admits of perfect ventilation, and consists of luxurious accommodation amidships for 50 first-class. The large and roomy state-rooms are situated on the upper deck before the machinery, and are furnished with the most recent improvements, including wire-woven berths, folding wash stands, electric light and bells, and very complete bath and lavatory accommodation. Above on the bridge deck is a handsome dining-saloon and music-room, finished in polished hardwood, and furnished with sideboards, bookcases, piano, &c. There is also a commodious smoking-room, and overhead a sun deck, on which the boats are placed, which forms a sheltered promenade for the first-class passengers. In the poop there are very comfortable quarters for 40 second-class, with a dining-saloon, smoking-room, and large state-rooms, scarcely inferior to the first-class, and the 'tween decks afford spacious accommodation for emigrants or troops. The machinery consists of a set of triple-expansion engines, with cylinders 26 in., 43 in., and 70 in. diameter, by 4 ft. stroke, and two boilers for a working pressure of 175 lbs., and fitted with the most recent improvements for efficiency and economy. The results of the trial were most satisfactory, a speed of 13 knots having been easily maintained without any trace of heating or priming. Having been built with a cut-water bow and figurehead, the ship has a very symmetrical appearance, and her smart rig gives her the look of a large yacht. Altogether the *Australian* is a fine specimen of a high-class merchant steamer, and will be commanded by Captain Helms, who has been for many years in the company's service.

Golden Fleece.—On March 11th the trial trip of the steamer *Golden Fleece* took place between Blyth and the Tyne. She is intended for the fruit trade between the West Indies and New York. She is a steamer 320 ft. by 35 ft. beam, by 26 ft. depth of hold, and has just received very extensive alterations at the hands of the Blyth Shipbuilding Co., Limited, of Blyth, who have converted this vessel from an ordinary cattle-carrying boat into one of the finest and largest fruit-carriers. As is well known, the question of ventilating the holds is one of paramount importance in fruit steamers, and a new arrangement has been adopted in this vessel, whereby all the air in the holds is renewed in less than one minute, and arranged in such a manner that a continuous current of air sweeps the holds from one side to another, so that no stagnant air can lodge in any particular place. Those who are acquainted with the trouble of ventilating ships are best able to comprehend what this means, and the difficulties which have had to be surmounted. The upper and lower 'tween decks are insulated all fore and aft. The complete ventilation of the holds has been effected partly by mechanical means and partly by utilizing the waste heat from the boilers, thus reducing the cost of such installations, which in this case deals with over 60,000 cubic feet of air per minute, and is believed to be the largest quantity of air dealt with in a ship up to the present date. In addition to the above, one of the holds has been fitted with a refrigerating plant on the ammonia system, which will be capable of keeping the temperature down so as to prevent the overheating of the fruit. The alterations made in the main engines by the engineering establishment of the Blyth Shipbuilding Co. have been of such an extensive character as to increase the speed of the vessel by 1½ knots over anything she has ever done before, while at the same time the alterations have tended to a very material reduction in the consumption of the fuel at former speeds. Messrs. Clarke, Chapman & Co. have fitted a complete system of electric light installation, both for the ship's use, passenger accommodation, and working of the holds. The speed which was obtained at the trial gave the owners and the large party of invited guests unqualified satisfaction. It is interesting to know that the first steamer carrying fruit from the West Indies to New York was built 14 years ago for the same owners, and had only a gross tonnage of 600 tons, while the trade has so developed since that time, that the above-named steamer is now to be employed in the same service, and has a gross tonnage of about 2,200 tons, being the largest steamer afloat for the exclusive carriage of fruit. The whole of the alterations above referred to, including the system of ventilation adopted in this vessel, has been made to the designs of Mr. George Walker, consulting engineer and naval architect, of London, under whose superintendence the work has been carried out. The *Golden Fleece* is owned by the Argonout Steamship Co., of London, and immediately after her trial proceeded on her voyage to Jamaica.

St. Austell.—On March 11th the official speed trials of the twin-screw barge-loading dredger *St. Austell*, recently constructed by Messrs. William Simons & Co., Renfrew, to the order of the Admiralty, took place on the measured distance at Skelmorlie with very satisfactory results. Six runs were made with and against the tide, when it was found that fully a knot more than the contract speed was obtained. The Admiralty were represented by Messrs. Harris, Hay, Stewart and Scoggins. The vessel is to be employed at H.M. Dockyard, Devonport.

Atlas.—On March 12th the trial trip of the s.s. *Atlas*, built by the Elsinore Iron Shipbuilding and Engineering Co., Elsinore, Denmark, to the order of the Steam Navigation Co. "Neptun," Bremen, took place in the Sound, and was considered very satisfactory. This steamer is built of steel to the highest class at Germanischer Lloyd's, and her dimensions are 200 ft. by 30 ft. 3 in. by 12 ft. The engines are of the triple-expansion type with surface condenser. During the trial trip the engines indicated 550 H.P., and the normal speed was 10 knots, with a consumption of coal of only 1·32 lb per I.H.P.

Hillbrook.—On Friday, March 13th, the s.s. *Hillbrook*, built by Messrs. William Hamilton & Co., Port Glasgow, for Messrs. Hugh Evans & Co., of Liverpool, proceeded down the river to undergo her trial trip. The vessel, which has been designed for the company's general and Eastern trade, is 310 ft. long by 42 ft. 6 in. by 21 ft. 9 in. moulded, with a gross tonnage of 2,900 tons, and she will be capable of carrying 4,300 tons deadweight. The machinery, which has been constructed by Messrs. D. Rowan & Co., of Glasgow, is on the triple-expansion system, having cylinders 22½ in., 37 in., and 61 in. by 42 in. stroke. Steam being supplied by two large boilers at 160 lbs. pressure. She has been fitted with the Glasgow Patents Co. Improved Edmiston feedwater filter. The trial was most satisfactory, the mean speed on the measured mile being 10¾ knots, the engines working smoothly all day. The builders were represented by Mr. Wm. Hamilton and Mr. James Rowan, Mr. Austin Taylor, of Liverpool, along with Mr. Thomas, the company's superintendent, representing the owners. In the evening the vessel proceeded to Glasgow, having been chartered by Messrs. George Smith & Son, of the City Line, to load for Bombay, where she sails on April 3rd under the command of Captain Homewood.

Chun Sang.—On Saturday, March 14th, the steel spar-deck screw steamer *Chun Sang*, built by Sir Raylton Dixon & Co., Cleveland Dockyard, Middlesbrough, for the Indo-China Steam Navigation Co., Limited, of London, proceeded to sea under the command of Captain Evans, for her official trial trip. This vessel, which has been specially designed and equipped for the Company's trade in China, is 300 ft. by 40 ft. by 25 ft., and has a deadweight carrying capacity of about 3,400 tons, with arrangements in 'tween decks for carrying Chinese passengers. The spar deck is of steel sheathed with teak, and the bridge and forecastle decks are also of teak. Engines of the most approved triple-expansion type are by Messrs. The North-Eastern Marine Engineering Co., Limited, Sunderland, and the boilers are fitted with forced draught on Howden's system. The hull and machinery have been constructed under the supervision of Mr. Buchanan and Mr. Duncan. Mr. James Keswick, of Messrs. Jardine, Matthieson & Co., Mr. Cheyne, secretary of the Indo-China Steam Navigation Co., and others, were on board during the trial trip, which passed off most successfully.

Kylemoor.—On March 17th the trial trip of the steamer *Kylemoor*, built to the order of Messrs. Walter Runciman & Co., Newcastle, by Messrs. John Readhead & Sons, West Dock, South Shields, took place off the coast outside Shields Harbour. There was a strong gale blowing from the west, but otherwise the weather was fine, and everything passed off most successfully. The vessel is 323 ft. long, 46 ft. broad, 25 ft. 6 in. deep, and is classed 100 A1 at Lloyd's. She has been built on the improved single-deck principle, with poop aft, containing cabin accommodation, a long bridge amidships for officers' accommodation, and topgallant forecastle for the crew. She is fitted with steam winches, windlass, and steering gear, shifting boards for grain, and all the latest improvements for the ready discharge of cargo. Her deadweight capacity is over 5,100 tons on a light draught. The engines are also the work of Messrs. Readhead, and are of the triple-expansion type, having cylinders 24 in., 40 in. and 64 in. diameter by 42 in. stroke. Steam is supplied by two large steel boilers working at a pressure of 160 lbs. per square inch. The vessel's machinery worked most smoothly, and after her trials over the measured mile it was found that the speed obtained was 11½ knots per hour, against a strong wind, which was considered most satisfactory.

Iolaire.—On March 16th the new 750-ton steam yacht *Iolaire*, just completed for Sir Donald Currie by Messrs. Ramage & Ferguson, Limited, Leith, proceeded down the Firth of Forth to run her speed trials at Gullane Bay, although the half gale of wind blowing on that date from the S.W. precluded any chance of very favourable results being obtained. All the same the fairly good result of 13·58 knots was got on the mile, but immediately afterwards the wind veered round to N.W. with hurricane force, rendering further trials impossible. On the way back from the mouth of the Firth a tremendous sea was encountered, but the yacht behaved splendidly although for minutes at a time her bows could hardly be seen for flying spray. No heavy seas were shipped, however, and the yacetsmen on board were unanimous in pronouncing the *Iolair* a really good sea-boat.

Maritta.—On March 17th the steel screw steamer *Maritta*, built at the Walker-on-Tyne yard of Sir W. G. Armstrong, Mitchell & Co., was taken to sea for her trial trip. The vessel has been built for La Société Anonyme Belge de Navigation à Vapeur, to the order of the managing owners, Messrs. Schenker, Walford & Co., London. The principal dimensions of the vessel are:—Length, 330 ft; breadth, 46 ft.; depth, 26 ft. She is capable of carrying about 5,000 tons on her statutory draught. The *Maritta* has been fitted by the Wallsend Slipway and Engineering Co., with triple-expansion engines, which on the trial trip gave every satisfaction.

Malvina.—On March 18th the London and Edinburgh Co.'s steamer *Malvina* went up the Firth of Forth on her trial trip, after having undergone extensive repairs and alterations by Messrs. Ramage & Ferguson, Leith. With the exception of the hull, the vessel may be said to be practically a new ship. She is intended for the company's passenger trade between Leith and London. The engines have been converted from compound to triple-expansion, from designs by the company's engineer, Mr. R. Young. There have been supplied two large single-ended boilers, which give more space in the engine-room. The cylinders of the engines are 25 in., 43 in. and 68½ in. by 48 in. stroke. The boilers are constructed for a working pressure of 180 lbs., and are also constructed to work with a forced draught when required. From the smart appearance of the vessel, it is expected that she will become as great a favourite as she was some years ago when on the regular passage. Amongst those on board were Mr. T. Aitken (manager of the company), Mr. Ramage (of Messrs. Ramage & Ferguson), and others. The trials gave great satisfaction. Under natural draught the vessel developed a speed of 15 knots, but under forced draught she is expected to do fully 16 knots. The *Malvina* will be commanded by Captain Main.

Algoa.—On March 24th this vessel, which has been built and engined by Messrs. William Doxford & Sons, Limited, Pallion, left the Wear for her official trial trip, after which she proceeded direct to Cardiff. She has been built to the order of Messrs. Crow, Rudolf, & Co., Liverpool, and at this date is the largest cargo vessel yet built in Great Britain, her deadweight capacity being 11,375 tons. The dimensions, over all, are—465 ft. by 58 ft. by 35 ft., and load draught 26 ft. She has tri-compound engines of 29 in., 50 in., and 80 in., by 51 in., with two single-ended boilers fitted with Brown's induced draught and Serve tubes, enabling the vessel to steam fully 10½ knots when loaded. She is exceptionally well arranged in the question of discharging gear, being fitted with 18 cargo derricks, all of which are carried on side posts so as to shorten the radius of the derricks necessary to put the cargo clear over the side. This is an arrangement which was originally adopted by Messrs. Doxford in the large steamer built by them for the British-India Steam Navigation Co. in 1890, and is a system of cargo-gear which has given every satisfaction. These posts are fitted vertical with the keel-line, enabling the derricks to be easily moved either in or out, saving a large amount of labour which is usual in the ordinary arrangement of having derricks on raked masts. There are nine horizontal steam winches by Messrs. Clarke, Chapman & Co., Limited, with all the latest improvements, these being fitted in position so that each winch works two of the derricks; and it may be mentioned at this point that similar vessels, the *Samoa* and *Maroa*, fitted with similar arrangements of cargo gear, have made some exceptionally rapid loading and discharging records. In the steering arrangement for this vessel there has been adopted the new arrangement of Messrs. Fawcett, Preston & Co., of Liverpool, in which hydraulic power is used, the gear being of exceptional simplicity and very rapid in its action, and from experience already gained has been found particularly economical in steam consumption, as the motive power, that is, the hydraulic pumps, are fitted in the engine-room, in close proximity to the boilers; the controlling wheel for these pumps being fitted on the bridge amidships. In addition to this gear the vessel is also fitted with Messrs. Harfield's patent compensating hand gear, which will enable even this very large vessel to be easily steered by hand. The anchor gear is also of an exceptional nature, consisting of two independent steam windlasses by Messrs. Clarke, Chapman & Co., with vertical engines, each operating independently one of the cables, and also one steel wire mooring rope, each having its own independent break and clutch gear. These engines also drive direct two mooring capstans, by the same makers, and what is perhaps unique in this gear is the arrangement by which the engine operates the capstan shaft, the windlass gear being only put in use when required; and it will be readily seen that there is considerable advantage in this arrangement, as the principal amount of work to be done in such vessels is the manipulation of the mooring ropes in harbour. At the after end of the vessel there are also fitted two similar capstans for manipulating the after ropes. The accommodation for officers and engineers is of an exceptionally spacious character, and is very handsomely fitted up, the whole being done in hardwood, and all these cabins being built on the upper bridge, makes them particularly airy and comfortable for Eastern climates. The vessel is also fitted throughout with electric light on Messrs. Clarke, Chapman's system, with four large deck clusters for cargo working, and the usual arrangement of lighting throughout engine and boiler spaces, cabins, holds, &c. On the trial trip, after the adjustment of compasses, the vessel was run at full speed, when a record of about 11½ knots was shown. This vessel has been built throughout under the superintendence of Mr. F. J. Pilcher, of Liverpool, representing the owners.

King Edgar.—On March 24th this vessel, which was recently launched from the yard of Messrs. Short Brothers, Pallion, and built to the order of the Scottish Steamship Co., Limited, of which Messrs. Phillips & Co., of 9, Gracechurch Street, London, are the managers, went out on trial, and when compasses were adjusted was run over the measured mile, and after a series of runs a mean speed of 11 knots was attained, which was considered very satisfactory, the engines working with perfect smoothness and absence of vibration, and steam being easily maintained at a pressure of 180 lbs. This vessel has been constructed in excess of Lloyd's requirements for the highest class, and is of the following dimensions:—Length, 304 ft.; breadth, 44 ft.; depth, moulded, 23 ft. 2 in. She has full poop, fitted up in polished hardwoods, for the accommodation of captain, officers, &c., open bridge amidships, with engineers' accommodation, chart-house at fore end, with house overhead for controlling gear of steering engine, which is placed on engine-room platform; and topgallant forecastle fitted up with commodious apartments for petty officers and crew. The double bottom throughout is constructed on the cellular principle, divided into trimming compartments for water ballast, a large vertical multitubular boiler supplying steam to five powerful steam winches for working cargo. In order to leave the holds clear for cargo, deep framing and side girders have been substituted for beams and web frames. The engines, which have been supplied by Messrs. Blair & Co., Limited, of Stockton, have cylinders 23 in., 37½ in. and 61½ in., with a stroke of 39 in., steam being supplied by two large boilers working at a pressure of 180 lbs. per square inch. At the trial the owners were represented by Mr. W. B. Cumming, of Liverpool, under whose supervision the vessel and engines have been constructed.

St. Ives.—The dredger *St. Ives*, recently constructed by Messrs. William Simons & Co., Limited, to the order of the British Admiralty for service at Portsmouth Dockyard, has completed her dredging and steaming trials with satisfactory results. The dredging trials consisted of loading hopper barges at the rate of 700 tons per hour. The steaming trials took place at Stokes Bay, and both results were considerably over the contract conditions. The dredger *St Ives* has buckets of 20 cubic feet capacity and is able to dredge to a depth of 46 ft. below the water level.

Valhalla.—The *Valhalla* is a fine steel screw steamer, and has been built by Messrs. Wm. Gray & Co., Limited, to the order of Messrs. Herskind & Co., of West Hartlepool. She is the 25th vessel which the builders have supplied to this firm. Her principal dimensions are:—Length over all, 310 ft.; breadth, 43 ft.; depth, 19 ft. 11 in.; and she has been built to Lloyd's highest class. She is of the partial awning deck amidships type, with poop, raised quarter-deck and short well and forecastle, and fore-and-aft schooner rig. A cellular double bottom is fitted, and also an after peak tank for water ballast. The engines have been supplied by the Central Marine Engine Works of Wm. Gray & Co., Limited, and are of their well-known triple-expansion type, having cylinders 22 in., 35 in., and 59 in. diameter, with 39 in. stroke, supplied with steam by two single-ended boilers 14 ft. diameter by 13 ft. long, working at 160 lbs. pressure per square inch. The vessel left the Tees fully laden on March 13th, and was manœuvred in the bay for the purpose of adjusting compasses, etc., till about 10 a.m. when she was met by a tug from Hartlepool conveying the inspecting engineers and others interested. The trial which the vessel and her machinery then underwent was considered eminently satisfactory, the engines working with great smoothness, the bearings keeping perfectly cool, and the boilers maintaining an ample head of steam and remaining perfectly tight. The owners were represented by their inspecting engineer, Mr. Fothergill, the engine builders by Mr. Lindsay. After the trial the vessel proceeded with her cargo of rails on her first voyage to Bombay.

Reviews.

Steam Vessels and Marine Engines. New York: Office of the *American Shipbuilder*. 1896.

Mr. Foster Howell has contributed a very interesting and useful work to the History of the Development of Steam Navigation. His work is infinitely less pretentious, and far more exact, than the works of the recent British writers who have managed to make names for themselves by writing histories of this wonderful expansion. Mr. Howell's book is illustrated in the best style of American bookwork. We can give it higher praise. He gives illustrations of the *S. Louis* and her engines with appropriate letterpress, but this is by no means all the interesting or up-to-date matter he gives us. Readers of the Marine Engineer have not much to learn about the *S. Louis*, but the illustrations of the *North West* and her sister—the pair of twin-screw triple-expansion engined liners built for the passenger trade of the great lakes—will be of interest to professional readers, whilst, as pictures, they will excite the admiration of every one who sees them. These vessels must be of interest, too, on account of the fact that they are fitted with the Belleville boiler. Indeed, it would appear that the water-tube boiler is making at least as great progress in the States as it is in this country.

Accounts are given of various fine vessels recently built for the so-called coasting trade of America. Coasting is done on as big a scale as other matters in the great country over the Atlantic, and fine vessels are engaged in its work which are not often heard of by English readers. But the work is not confined to accounts of American-built ships. The Anchor liner *City of Rome*, the quondam National steamer *America*, the Cunard flyer *Campania*, and several other European celebrities are included in the matter of this volume. Early history is represented by a very careful drawing with an equally careful description of the old *Savannah*, the pioneer of Atlantic steam navigation. Mr. Howell does what few writers in his particular line condescend to do, namely, he renders thanks to the editors of the papers whose articles he has used for the purposes of his work. The book is, however, not by any means only the compilation he would have us to believe, and that most modern volumes on this subject are. It embodies a certain amount of original research, and the author deserves the credit which he denies himself. We can cordially recommend this volume to those of our readers who desire to be informed of the progress of merchant steamer navigation in American waters.

The Howard, Smith Line Handbook for Travellers.

This volume is circulated by the well-known and enterprising shipowners of Melbourne, Messrs. Howard, Smith & Co. The line comprises some vessels well-known even to those of us who have never been to the Antipodes. Amongst the thirty thousand odd tons of the fleet are to be found a former Union liner and a vessel which was originally built for the General Steam Navigation of London. These vessels are employed in the passenger and goods traffic between the various Australian colonies. Besides the interesting information regarding the development of the line itself and the illustrations of the various fine steamers under its flag, the book contains a great deal of solid and useful information regarding the colonies themselves. There are excellent reproductions of instantaneous photographs showing the business centres of various important cities as well as of some pleasure resorts. A brief history of the colony is also given as well as a vast amount of information of great utility to travellers and traders. Here we may instance the tariff schedules for the various colonies, and the telegraphic and postal arrangements of the different colonies. The whole is a very interesting and useful guide to a line which evidently has the vigour and push which characterise the great countries for whose convenience it caters.

Tabulated Weights of Iron and Steel. For the use of Naval Architects, &c. By Chas. H. Jordan. London: E. F. Spon. 1896.

The fifth issue of this useful pocket-book adapts it to the most fastidious requirements of the modern designer. Plates have been added to show the basis upon which the tables have been calculated. Tables relating to the standard sizes and forms of bulbs to bulb plates, to bulb beams, and bulb angles, approved by Lloyd's and adopted by steel and iron manufacturers and shipbuilders, have been added. Tables relating to tee bars are also a new feature, it being found that the tables relating to angle bars were not accurate when applied to the sections.

Facility of reference, which is a great point in the measure of usefulness of such a volume as the present, has been effected by the introduction of different coloured papers for the different matters treated of in the volume. There is an immense amount of information compiled and worked out certainly, with great patience, and as far as we have been able to test it, with as great accuracy, in this volume, and it is all matter which will be found of every-day use to those for whose service the book has been compiled.

Refrigerating and Ice-making Machinery. By A. Wallis Tayler. London: Crosby Lockwood & Co. 1896.

The universal extension of the cold storage system, both on sea and land, has made some knowledge of the principles underlying all refrigerating machinery as important to the engineer as is similar knowledge relating to electricity. Thus it is that we recommend the present text-book to our readers.

The present work is a practical manual. It discusses the various types of machines based on the various principles now applied for this most important duty. It discusses the working of those with reference to the conditions under which engineers are likely to meet with them and tells of their weaknesses and of the remedies that should be applied when they are out of order, or display signs of failure, or of want of economy.

The attention of the author is not confined to the actual refrigerating machine itself. He also regards the installation generally, noticing the storage, without which the machine would have no object in existence. Many useful tables are given, and also comparisons of the working of the different systems. The whole volume is excellently illustrated, and has a full index. It is sure to be found useful by the engineers for whose use it has been written.

Miscellaneous.

Fleming, Birkby & Goodall, Limited, Mechanical Leather, &c., manufacturers, of Halifax, Manchester, Liversedge, Brighouse and elsewhere, have placed their London representation with Mr. J. E. Lawler, of 36, Lime Street, E.C.

Ships' Cabins and their Fittings.—On Monday evening, March 9th, the members of the Hull and District Institute of Engineers and Naval Architects held their regular monthly meeting, at which Mr. F. Somerscales, of Earle's Shipbuilding & Engineering Co., read an interesting and most instructive paper entitled "Ships' Cabins and their Fittings," the President of the Institution, Mr. F. H. Pearson, being in the chair. The reader of the paper, with the aid of large-sized diagrams and blackboard sketches, minutely described the various designs and manifold details of construction of ships' cabins and saloons, both above and below deck, clearly explaining the reasons for such methods of construction and their attendant advantages and disadvantages, and also drawing particular attention to the practical difficulties experienced in obtaining a satisfactory design when viewed from an architectural standpoint. The paper was listened to with great interest and at its termination a short discussion was raised, in which Messrs. F. H. Pearson, W. B. Dixon, and R. Pawley took part, Mr. Somerscales replying to the points thus raised, and the meeting terminated with a vote of thanks to the lecturer, proposed by the president and seconded by Mr. J. Spear.

The Anti-Attrition Metal Co., of Emerson Street, Southwark, London, S.E., are sending out to those interested in this metal a six-inch pocket rule, with English and French scales thereon, which is made of their Anti-Attrition Metal, and will well serve the purpose intended.

Messrs. Caddy & Company, Ltd., in consequence of the development of their business, have found it desirable to re-construct their company, which will in future be known as Caddy & Co. (Nottingham), Limited.

Scotswood Shipyard.—It is stated, on apparently good authority, that Messrs. Armstrong, Mitchell & Co., have leased the Scotswood Shipyard, which has been idle for some time. The inference to be drawn from this, is that the company contemplate relieving the pressure at the Elswick yard by putting down some vessels on their newly-acquired premises.

Delta Metal Co. Limited.—At the proceedings at the eighth annual general meeting of the shareholders of the Delta Metal Co., Limited, held at 110, Cannon Street, London, E.C., on Tuesday, March 10th, 1896, Mr. Charles Cammell in the chair. The chairman stated that the different departments at the Company's works had been well employed: in fact, it had been found necessary to work overtime during a considerable part of the year, more particularly in the squeezing department: important orders were executed during the year and other large contracts are still in hand. Owing to the increase of the company's business it was found necessary to make some additions to the plant at the Pomeroy Street works and some further extension might be required shortly. With regard to the company's patent metal squeezing machines, in order to facilitate the development of this branch, the directors had decided to grant a few licenses for working such machines on royalty under the company's patents. An arrangement of that kind, based on the profit-sharing principle, had already been made with one of the leading metal rolling mills in the provinces. This would no doubt form the basis of a mutually profitable business, as the company's system of squeezing alloys offers a considerable saving in first cost and in working expenses, as well as other very important advantages, over the ordinary method of rolling and drawing metals, and as there is a very great demand for the class of work such as those machines produce. The statement of accounts and report were unanimously approved and adopted, and a dividend of 5 per cent. for the year 1895 (after writing off plant, &c., £733 6s. 6d. and adding £200 to reserve for doubtful debts) was declared: the balance to be carried forward to new account. The retiring director, Mr. Charles Cammell, was unanimously re-elected, and Mr. George Williams, chartered accountant, re-appointed auditor for the current year. A vote of thanks to the board and the chairman concluded the meeting.

Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships, from February 14th, to March 10th, 1896.

3282 A. W. Knotts. Generating steam in boilers.
3309 P. Ford and G. M. Hamlyn. Chocks for ships' boats.
3331 W. Reynolds and L. G. Astley. Automatic lubricators.
3371 A. Jefferson. Finding a ship's course on the chart.
3389 C. F. Hunter and H. C. Shaw. Engine cranks.
3439 C. A. Williamson. Lifebuoy.
3523 A. Boyd. Actuating slide valves.
3564 W. J. Jobling. Steam generators or boilers.
3569 E. Petzholtz. Furnaces.
3651 H. J. Chapman. Marine alarm signalling machine.
3674 L. Schutte. Safety device for boilers, &c.
3680 D. Vickers. Cementing of armour plates.
3689 H. W. Phillips. Water-tube boilers.
3700 A. M. Clark (T. J. Eldridge, China). Boat-detaching gear.
3750 E. Waddington. Metallic packing for rods.
3758 T. Keene. Packing for piston rods, &c.
3816 J. Sampson. Steam generators.
3818 T. Lloyd. Securing covers of ships' hatches.
3822 H. Swanton. Method of controlling engines.
3827 W. Chadburn. Indicating shafting.
3837 W. H. Lindsay. Controlling propeller shafts.
3842 H. Berry. Cranes.
3845 G. W. Thompson. Self-reversing gear for engines.
3871 J. E. Olsson. Lubricators.
3938 T. Pearson. Method of raising sunken vessels.
3942 J. B. Howard (H. Wehner, Germany). Removing ashes on ships.
3950 F. Dye. Covering for water and steam pipes.
3977 E. T. Hughes (F. Heather, United States). Folding boats.
4017 E. Bacon and W. J. Wood. Working fishing gear.
4018 J. Turner and W. Elliot. Swing boats.
4032 A. A. Dieriex and W. Jordan. Boats' davits.
4048 R. Rutley. Submarine torpedo boats, &c.
4081 J. and E. Wright and J. Amos. Pistons.
4088 J. Donaldson. Torpedo boat destroyers, &c.
4104 A. Blechynden. Controlling auxiliary engines.
4126 A. G. New. Propulsion by means of oil engines.
4131 F. A. Dixon. Locking loose stocks of anchors.
4188 J. Haythorn. Steam boilers.
4208 W. Griffiths and V. C. Read. Boilers.
4217 S. J. Bird. Differential speed governor.
4246 J. Dow. Speed governors for steam engines.
4248 H. V. Holden. Tempering of armour plates.
4250 M. T. Reade. Collapsible boats.
4284 J. Rhodes. Surface condensers of engines.
4315 G. C. J. Topp. Form of propeller for vessels.
4323 E. Petersen. Supplying feed-water to boilers.
4326 J. H. Dickinson. Armour plates.
4335 A. G. Jardine. Fishing tackle.
4352 H. McIntyre. Water-tube boilers.
4359 J. Holloway. Steam engines.
4361 J. Hale. Expanding propeller.
4362 H. Davies. Sail.
4388 J. R. Mitchell. Securing condenser tubes.
4392 J. Apsey and F. B. Hill. Steam boiler furnaces.
4401 A. O. Haselwood. Funnels.
4412 M. D. Rucker. Connections for cranks, &c.
4413 H. H. Griffin. Variable speed gears.
4414 J. H. Hutchings. Boats.
4420 T. H. Lucas and H. B. Martin. Furnaces, &c.
4444 H. J. Watkins. Propelling boats.
4480 L. Parker. Slide valves of steam engines.
4485 E. W. Frankenberg. Cushions for ships, &c.
4492 F. L. Martineau. Internal combustion engines.
4502 D. N. Sinclair. Ladders for nautical purposes.
4503 M. T. Reade. Collapsible boats or baths.
4504 L. T. Gaskill. Disengaging gear for boats.
4520 H. C. Platts and T. Lowther. Packing for joints.
4521 W. Naylor. Cylinder jackets of engines.
4523 A. Spencer. Shields for water gauge tubes.
4535 J. Murrie. Heating water for boilers.
4550 W. Chattaway. Lubricators.
4551 O. F. Vollhard. Steam generators.
4557 J. Johnson. Mechanical stokers.

4558 A. M. Robinson. Shaft bearings.
4590 J. Y. Johnson (La Société Anonyme des Forges and Chantiers de la Mediterranée, France). Leaks in ships.
4641 W. D. Wight, M. B. Wild, and T. Rydea. Valves.
4651 A. T. Chorley and W. M. Llewellin. Boilers.
4654 J. W. Reed. Steam generators.
4675 A. H. Mitchell. Gear for overside cranes.
4687 T. Myers. Oars and sculls.
4696 T. G. Stevens. Marine steering gear.
4708 M. H. P. R. Sankey. Compound steam engines.
4720 C. A. F. Meissner. Screw propellers.
4724 H. F. Phillips. Boilers.
4746 W. Schmidt. Combined steam engines, &c.
4756 B. A. Thomas. Grate bars for boilers.
4795 E. Gentilini. Fire-boxes for steam boilers.
4804 F. Mossberg. Thrust bearings.
4831 A. J. Boult (E. J. Muller, United States). Piston rods.
4847 E. Montier. Boilers.
4863 A. W Bevis. Compasses.
4868 W. Cameron and J. Cochrane. Valves.
4873 F. Farnworth. Valve.
4907 J. Weir. Smoke-consuming furnaces.
4966 F. Wilkinson. Feed-check valves for steam generators.
4976 T. L. Miller, W. H. Jackson, and W. J. Thompson. Controlling the supply of water to boilers.
4982 A. G. Ramage. Computing stability of ships.
4994 J. Weir. Boilers.
4995 J. Weir. Boilers.
5062 W. W. Meek. Lifeboat lowering apparatus.
5064 T. Keene. Metallic packing for piston-rods.
5084 D. L. Altman. Self-oiling journal bearings.
5095 F. Bemford and W. Wadsworth. Sight-feed lubricators.
5096 W. Lockwood. Spring rings for pistons, &c.
5117 J. T. Oliver. Batten cleat for ships' holds.
5127 C. Christmas. Steam boiler furnaces.
5140 C. M., H. S., and F. Mundahl. Deep-sea machine.
5202 G. Goepel and J. Scheinhüttee. Steam boiler.
5205 J. Simonis. Water-tube steam boilers.
5206 C. Pataky. Steam generators.
5213 H. Wilcke. Steam generators.
5214 A. E. Jackson and J. P. Jackson. Steam traps.
5265 J. H. Dickinson. Manufacture of armour plates.
5313 W. N. Dack. Boilers.
5317 W. Bell. Boats' booms and lashings.
5321 G. Bendler. Steam engines.
5322 J. A. and S. Fletcher. Water gauge glasses.
5323 G. B. Goodfellow and E. A. Pickup. Lubrication of machinery.
5333 W. C. Morison. Ventilating ships.

BOARD OF TRADE EXAMINATIONS.

NOTE.—1C denotes First Class; 2C, Second Class.

February 22nd, 1896.

Aitken, W. R.	2C	Cardiff
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Briggs, J. J.	1C	W.H'pool
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Byrne, M. W.	1C	Liverpool
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Evans, J. H.	1C	London
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Whinney, C. M.	1C	Liverpool
Whitfield, E.	1C	N.Shields
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February 29th, 1896.

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Duncan, A. S.	1C	,,
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Urquhart, G.	1C	,,
Warren, J.	2C	Sun'land
Young, F. R.	2C	N.Shields

March 7th, 1896.

Allen, W. G.	1C	Cardiff
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Woodward, C.	1C	London
Wright, W.	2C	Dundee

March 21st, 1896.

Atkinson, C. A.	2C	N.Shields
Barrett, A. J.	C	London
Brown, J. J. N.	2C	N.Shields
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Walker, W.	2C	London
Wanless, R.	1C	W.H'pool

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PAGES xii. & xix.

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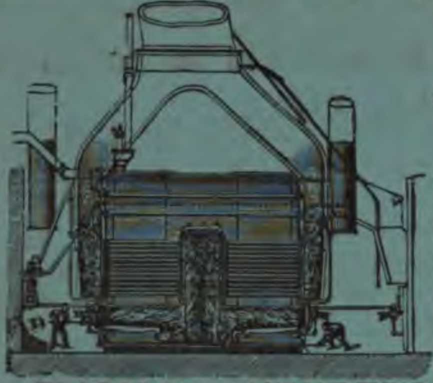

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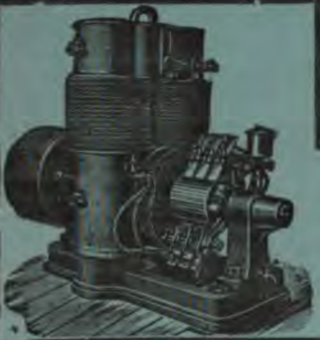

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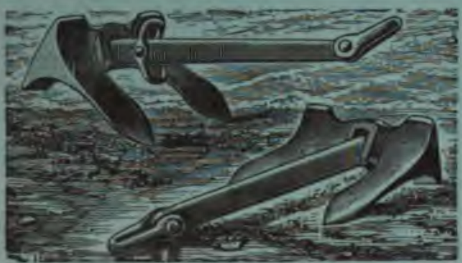

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The Marine Engineer.

LONDON, MAY 1, 1896.

WE are in the age of rigid analytical investigation, and the various problems of the steam engine and boiler as to thermal efficiency, measured by the feed water evaporated per weight of coal consumed, is one of the problems most frequently requiring accurate analysis both on shore and at sea. Any suggested method which may have facility of execution and accuracy as to results, particularly at sea, is therefore a subject of interest to us and our readers. Mr. C. C. Stromeyer, M.I.N.A., has given to the Institution of Naval Architects a most interesting and novel suggestion in this matter, viz., how to measure feed and circulating water by chemical means. Such means are already applied to the determination of weight of the waste gases of combustion, which otherwise defy accurate mechanical measurement, and following this principle Mr. Stromeyer has succeeded in measuring both the amount of steam condensed and the circulating water of a marine engine without actually or mechanically measuring either. This he does by a careful chemical estimate of the salinity of the condensing water where admitted direct as an injection, and of the resulting discharge water, and the ratio would determine the added amount of condensed steam, which, being distilled water, would be free from salt. The test by nitrate of silver for salt is one that can be depended on for estimating the quantity of salt, or inversely the weight of water in which the salt may be dissolved to within one millionth part of such weight. In the case of land boilers where the feed is constant from some supply of town or hard water, the salinity of such water is appreciable by the same test, and as the salt held in solution by water cannot evaporate with the steam, the residue of the water, when not blown out, must contain an increasing saturation of the salt, which increased saturation on chemical quantitative analysis will accurately determine the amount of water passed through the boiler if the final charge is accurately of the same volume as that with which it was first filled. That is, of course, a direct measure of the feed and of the water evaporated, errors being due only to leakage or to evaporation, whilst withdrawing samples for test. Caustic soda may be used for special salination of the feed or circulating water, but is not recommended. The measurement of the amount of hot water carried overboard from the hot-well pump with its temperature is an excellent gauge of the heat wasted from the condenser. The method of test for salt or salinity recommended is as follows. A standard known solution of nitrate of silver is first prepared. The sample of water to be tested is poured into a beaker, to which a few drops of a strong solution of yellow chromate of potash is added. The silver solution is then placed at a known or marked level in a tube or burette, and as much is run into the beaker as would cause the sample water to change its colour from a pale yellow to a reddish brown. With a little practice this can be done with the greatest nicety when there is not too much salt present to cause a milky precipitate of silver chloride. The amount of silver solution used from the marked burette will thus give the salinity of the sample tested. The alkalinity of the sea water or of any solutions of sea water can be tested accurately by the relative effect of the alkaline saline solution and a weak hydrochloric acid solution in destroying the colour of a few drops of aurine in the alkaline solution to be tested, which is a beautiful rose pink, until the point of disappearance is reached when the acid has neutralised the alkali.

THE microscopical examination of metals and alloys for information as to their molecular structure has been making great strides, and most valuable information as to the reliability of metals under strain or shock has been thereby attained. With practice and expert skill employed in such research having comparison in the first instances with the usual chemical analyses, it is probable in our opinion that equally accurate quantitative analyses, certainly as regards proportion of carbon and sulphur, might be as readily made by microscopical inspection as by direct chemical analysis, whilst the most essential information as to the disposition of the molecules, and homogeneity or otherwise of the metal, can be readily furnished by the first method whilst it cannot be in any way ascertained by the latter method. The value of microscopical investigation has been most clearly shown by a paper entitled "The Causes of mysterious Fractures in the Steel used by Marine Engineers as revealed by the Microscope," read by Mr. A. E. Seaton before the Institution of Naval Architects. It is well known that steel has the peculiarity of occasionally suddenly fracturing without any apparent indication of weakness externally, and without strain more excessive than that which the material has before borne with safety. It is the fashion at present to talk largely of the fatigue of metals, and the molecular change which they will undergo under continuous work and vibration. This, no doubt, may be the reason in many cases for sudden breakdowns, but it is as well to keep an open mind as to whether the disintegration may not be accelerated by improper and non-homogeneous structure, to which all metals are exposed, particularly those which are alloys, as steel is of iron and carbon with other alien elements present in some degree, such as sulphur, manganese, silicon and phosphorus. The carbides and sulphides of iron are readily to be distinguished from pure iron under microscopical examination of high power, such as 150 to 200 diameters, and the relative disposition and quantitative proportions of these various mineral substances are readily distinguished in steel under microscopic examination of the above power. The act that steel is usually liquefied and cast in masses before being worked, and that such working is usually reduced to the minimum possible, is all against the certainty that the various constituent bodies of the steel are in any way uniformly intermingled or interlocked. The tendency, therefore, to after-cracking or to fissures being developed under shock and strain, is essentially a character of large steel structures such as propeller shafts. It is well known that a fissure once commenced in steel tends almost of its own accord to extend and spread throughout the mass, which otherwise might have been considered homogeneous. Mr. Seaton gives an instance of a propeller shaft of Siemens' steel, made by a well-known and eminent firm, specified to be of mild steel containing from 0·2 to 0·25 per cent. of carbon, and which had been tested and passed both by the owner's representative and by the Board of Trade surveyor, and which, after running satisfactorily for 12 years, suddenly broke across the end without any previous external indication of flaws or cracks. Under chemical analysis of samples from the centre and exterior of the shaft, it was found that the interior was carbonized to a 50 per cent. greater extent than the exterior, and that the mean was 75 per cent. in excess of the highest specified proportion of carbon. The sulphur and phosphorus were also greatly in excess of what should be desired in pure steel, and this excess was most marked in the centre of the shaft. Apparently in such a forging, when made from a cast ingot, the carbide crystals of iron are not homogeneously distributed amongst the pure iron, but are collected in groups surrounded by walls of pure iron, and the relative preponderance of the relative partners will have much to do in determining the character of the shaft. The relative proportion in the centre and exterior of the shaft is most graphically shown in the microscopical examinations of samples from either part. But probably more important than this is the action of the sulphide of iron. This mineral seems to retain its liquidity much longer than the surrounding metal, and is therefore dispersed through it, generally in the pure iron walls between the groups of carbide crystals, in globules, ovoids, or elongated streaks, and these evidently form fissures or lines of cleavage throughout the mass. These globules and streaks are plainly seen in the microscopic fields. It is supposed in this case that disintegration commenced from the interior, and hence without external indication, and this is doubly to be feared. It is suggested that the boring out of the centre of a steel shaft, which detracts little from its actual strength to resist torsion, as practised by the Admiralty, is an excellent method to prevent the spreading of internal fissures from the centre outwards. Finally, it would appear that no steel structure, particularly when of considerable mass, and where wrought from cast ingots, can be considered to be known as to its structure until it has been microscopically examined as to molecular structure throughout a section of its substance.

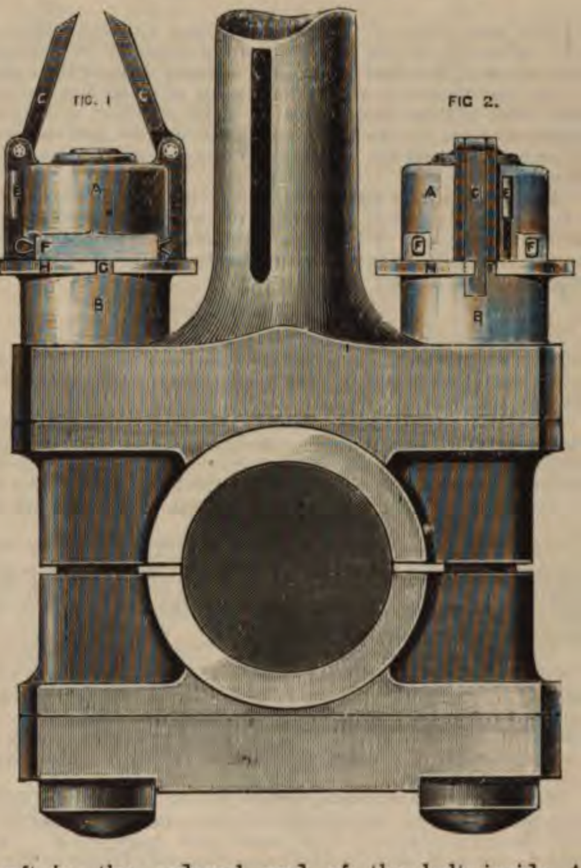
The carriage of grain cargoes, if we are to believe the evidence of Mr. George Herbert Little, master mariner, in his communication to the Institution of Naval Architects, is, as a matter of practice, in a chaotic and dangerous condition, in spite of the special regulations under the Grain Carriage Act of 1880. This appears to arise first from the fact that the Act does not apply to regulations made by the Board of Trade, and that as a consequence any number of "plans of loading" are approved and passed by the Board of Trade, and the Board of Trade has itself issued a series of technical regulations which are outside the Act, and not, therefore, affected by it. A ship may thus load a grain cargo under either of the above three alternative conditions, or may at choice mix up her system of loading under two or more different plans or regulations. Further, neither the Act, regulations, or plans seem specifically to regard the stability or tendency to instability of each individual ship to which the plan or regulation may be applied, nor is it the general practice of the masters to experiment upon or know much certainly as to the specific conditions of stability of their ship when loaded in bulk with grain. The acts and regulations seem to be directed only to the precaution of "feeders" to prevent "caving" in the cargo, under the impression that such feeding will always ensure a choked cargo, which therefore cannot shift. As a matter of fact it appears that such "feeders" can only automatically feed a very limited area, and that vacant spaces or "caves" in grain cargoes exist to a greater or less extent in all vessels carrying grain in bulk. Mr. Little tells us that settlement of a grain cargo will amount to 5 to 8 per cent. of the depth of the hold, that is to 9 in. in a hold of 15 feet. It is this space for the movement of the cargo that is so dangerous, and as a grain tight longitudinal centre bulkhead reduces the angle of disturbance for any weight shifted to one quarter of that which occurs without such bulkhead, no grain laden cargo vessel should be without one. Grain-laden steamers have generally but small stability, and this stability is liable to be wholly absorbed by a comparatively small shift of cargo, and it would be advisable in all such crank steamers that ballast should be used when grain laden. Curiously enough, large stability conduces to easy shifting of cargo but minimises its effect, whilst small stability retards shifting but accentuates its effect. Mr. Little's analysis of the losses of grain vessels in the winter of 1893-1894, points out that such losses may, in his opinion, be largely, if not entirely put down to shifting of cargo, and therefore to entirely preventable causes.

SEEING the constant increase in the number of vessels which have foundered in comparatively shallow water, the salvage appliances described by Mr. J. G. Kinghorn to the Institution of Naval Architects, and illustrated by us in our issue of February, deserve every attention, since the appliances at present in general use remain practically the same that were in existence when the first iron ships were launched, and their utility is necessarily circumscribed and fettered. Mr. Kinghorn considers his appliances suitable up to 25 or 30 fathoms, and depends upon camels, which have sufficient inherent buoyancy to lift any modern vessel, whether punctured by collision or otherwise. The camels are also provided with automatic lifting winches, which will raise any weight the steel wire rope can stand, to render the raising operations independent of tides. The actual weight being lifted by each winch is indicated to the engineer, and can be increased or slackened off, so as to distribute the lifting strain equally. We must refer our readers for further particulars of these highly improved salvage appliances to our illustrated article in our February issue.

NAVAL architects having had a surfeit of mathematical investigations and theories as to the rolling of vessels, are now to be induced to consider the pitching motion of vessels and the stresses produced thereby, by Lieutenant A. Kriloff, I.R.N., Professor of the Naval Academy at St. Petersburg. The professor begins by pointing out that no mathematical theorems applicable to rolling will apply to pitching, as the fundamental hypotheses of the late Mr. W. Froude, the pioneer of such investigations, are that the transverse dimensions of a ship are small in comparison with those of the profiles of waves, which is not applicable to pitching. Professor Kriloff gives a new and able theorem of pitching independent of the late W. Froude's hypothesis, and shows both a mathematical proof of its correctness and its results, and practical application, with numerical examples and calculations to illustrate its application.

MESSRS. DRYSDALE & STODDART'S PATENT COMPENSATING NUTS.

WE illustrate a novel arrangement brought out by Messrs. Drysdale & Co., "Bon-Accord" Engine Works, Glasgow, for automatically taking up the wear in crank pin or other bearings. It consists of a round nut B, having a collar H, and a separate brass cap A, inside of which is a coiled spring, one end E coming through the cap and the other end made suitable for going through a saw draft in the reduced end of the bolt inside A. Part of the nut B projects inside the cap, and has a groove all round it. Through the groove are passed the split pins F, which thus fasten the nut and cap together, while allowing them to revolve independently of one another. These nuts can be screwed on or off the bolts the same as ordinary nuts; the



mode of operation in putting them on being as follows :—

Hold the cap so that the end of the spring inside comes fair with the saw draft in the bolt, the pawls C being up clear, as in Fig. No. 1, then screw on the nut B. Meantime the cap A will not turn round, but will follow up with the nut. After the nut is up, the cap is given a turn in the opposite direction to that in which the nut was screwed, thus putting tension on the spring. The pawls C are now dropped into the notches G in the collar of the nut, as in Fig. No. 2, and this completes the operation. The compensating nuts will now take up, without further attention, the wear of the brasses until they are close together.

The advantages claimed for these nuts are :—1st, saving the time spent in stripping worn brasses; 2nd, silent running of the parts fitted with these nuts; 3rd, the brasses will wear longer; and 4th, there is practically no initial pressure on the crank pin.

CIRCULATION IN WATER-TUBE BOILERS.*

By Professor W. H. Watkinson.

THE main object of this paper is to draw attention to a series of models, which will be shown in action at the meeting, and which I have had constructed in order to show the nature of the circulation in the various types of water-tube boilers. The tubes in these models are of glass, ranging in internal diameter from ⅜ in. to 1½ in., and the drums are provided with glass ends, so that the whole of the action in the boilers can be observed.

As there has been a great deal of discussion, and as inaccurate views are still prevalent regarding the causes of circulation in water-tube boilers, it will be well, before describing the action in the various models, to summarise the author's conclusions regarding this matter.

Causes of Circulation.

"The causes of circulation in water-tube boilers are :—

"(1) The difference in density of the water due to difference in temperature when the fires are first lighted. This circulation is very sluggish.

"(2) When the water is all at approximately the same temperature, and steam is being generated, but not with sufficient rapidity to cause a break in the continuity of the water, a much more vigorous, but mainly local, circulation is set up by the entraining action of the bubbles of steam rising through the water.

"(3) When steam is generated with such rapidity, that in some part of the circuit there is steam or foam only present, a very rapid circulation takes place, due to the difference in density between this steam or foam and the continuous water in the downcomers, internal or external." †

These conditions are illustrated by the annexed diagrams. In Fig. 1 steam is not being generated rapidly enough to completely fill any portion of the tube A with either steam or foam, and the continuity of the water in A being unbroken, the only cause of circulation, assuming the water to be all at the same temperature, is the entraining action of the bubbles rising through the water.

By many the circulation, in this case, is said to be due to the difference between the density of the column of water in B, and the average density of the steam and water in A. That this is not so is shown by the experiment illustrated in Fig. 2, in which air is sent into the inner tube from a horizontal nozzle at C. When the top of the inner tube is above the water-level the rise of level in the inner tube is very small, and when the conditions are as shown the circulation is comparatively sluggish. If the nozzle C, however, be turned upwards a much better circulation is induced, but the action in this case is not analogous to that in a boiler.

Another way of regarding the matter is indicated in Fig 3, where a series of beads are shown attached to a fine wire.

When the beads are moved either upwards or downwards a circulation is set up due to their entraining action, exactly as in Fig. 1.

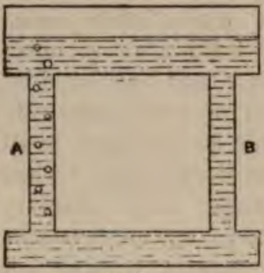


Fig. 1.

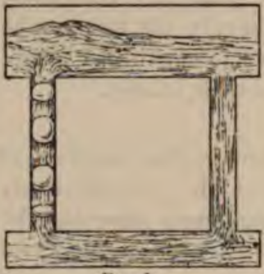


Fig 4.

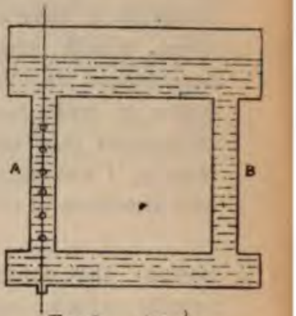


Fig. 3

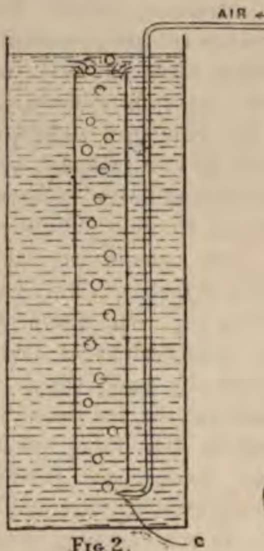


Fig. 2.

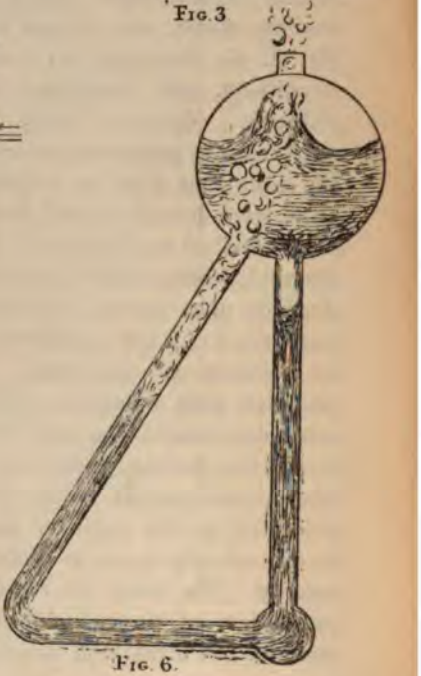


Fig. 6.

The circulation, therefore, under the conditions shown in Fig. 1 is due solely to entraining action, and not to difference in density of the substance in the two legs. It is due really to the difference in density between the steam and water in the same leg, which sets up a relative flow of the two, and the entraining action of the rising bubbles causes the circulation round the circuit, as well as the local currents which are at the same time induced.

In Fig. 4 steam is being generated more rapidly, and portions of the tube are filled with steam to the complete exclusion of water from these portions.

In this case a rapid circulation takes place on account of the average density of the substance in A being less than that in B.

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* Read at the thirty-seventh session of the Institution of Naval Architects March 26th, 1896.

† From a paper by the author, Inst. Engineers and Shipbuilders in Scotland, January, 1895

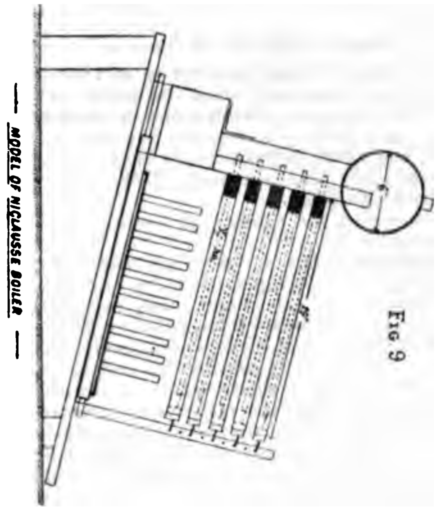


Fig 9

MODEL OF NICLAUSSE BOILER

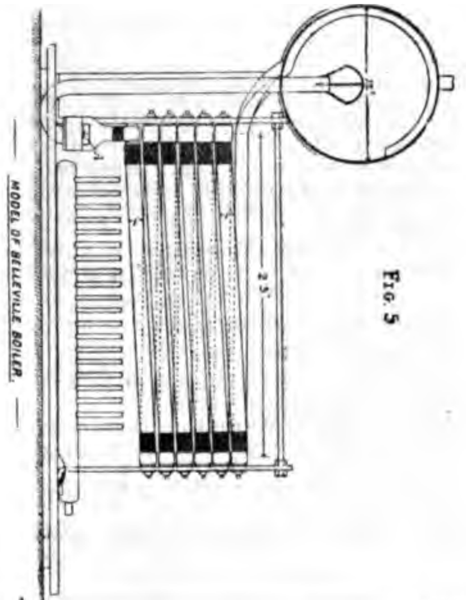


Fig. 5

MODEL OF BELLEVILLE BOILER.

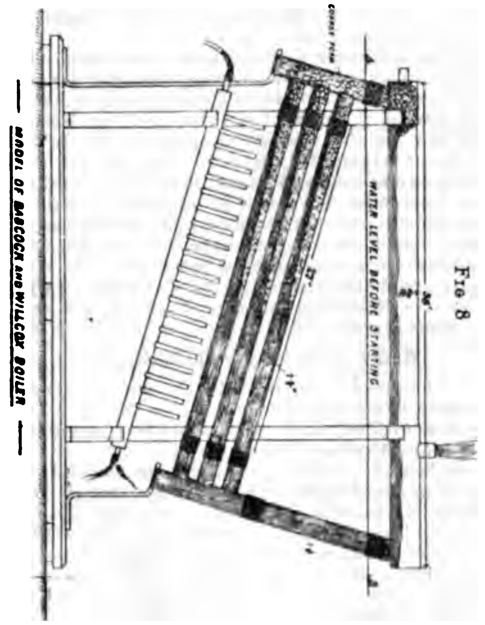

WATER LEVEL BEFORE STARTING
12"
18"

Fig 8

MODEL OF BABCOCK AND WILLCOX BOILER

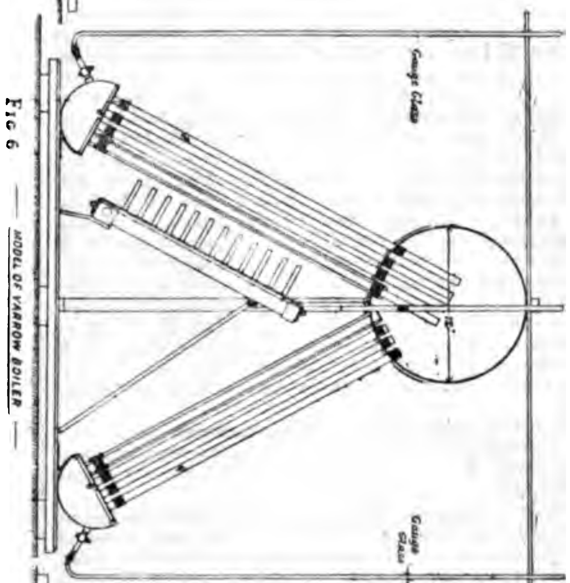
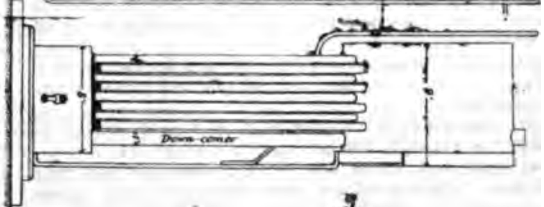

Gauge Glass
12"
Gauge Glass

Fig 6

MODEL OF YARROW BOILER


8"
Down-comer

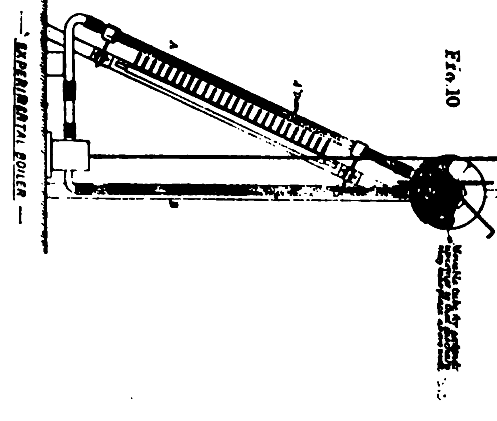


Fig.10

EXPERIMENTAL BOILER

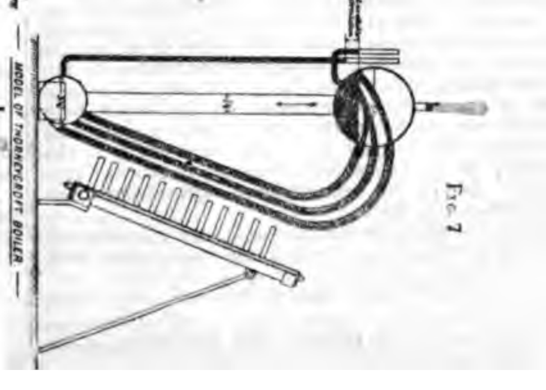


Fig. 7

MODEL OF THORNYCROFT BOILER

This kind of circulation is by far the most thorough, as none of it is merely local.

When working at atmospheric pressure, at rates exceeding about 2 lb. of steam per square foot of heating surface per hour, and with tubes 1¼ in. in diameter, the bubbles do not fill up the whole diameter of the tube, as shown in Fig. 4, but the upper part of the tube becomes filled with foam to the complete exclusion of continuous water, as shown in Figs. 7, 8 and 10.

The circulation in this case is, of course, due to the difference in density between the foam in tube A, and the corresponding column of water in tube B, Fig. 10.

The circulation in this case is also vigorous, but, as a considerable amount of water falls down from the foam, it is more local, and not as thorough as in the last case.

DESCRIPTION OF MODELS.

Model of Belleville Boiler. (Fig. 5.)

This consists of two elements, each containing 12 tubes of 15-16 in. internal diameter joined in series.

The distance between the centres of the end boxes is 2 ft. 3 in., and the inclination of the tubes is 4 per cent., as in actual boilers of this type.

The action of the automatic non-return valve at A is very clearly shown.

The normal level of the water is about that of the middle tube, but in starting, in order to prevent overheating of the upper tubes, it is necessary to have water in all the tubes.

The action in the Belleville boiler is so different from that in any other boiler that it may be well to explain it somewhat fully. As is well known, this boiler consists of a number of elements connected in parallel between the feed distributing box (as I prefer to call it) and the steam drum. The total length of tube in each element is roughly 150 ft., and, as the inclination is only 4 per cent., the upper end of this 150 ft. of tubing is only 6 ft. above that of the lower end, and the discharge into the drum takes place at about 1½ ft. above this.

If each element consisted of one straight tube 150 ft. long instead of twenty tubes connected by end boxes, as in the actual boiler, the circulation would be of the same nature as that in other water-tube boilers, and a circulating force of, say, 1 lb. per square inch (assuming the head effective for circulation to be 2 ft.) might be great enough to push the water through the tubes, in spite of their great length. Owing, however, to the abrupt changes in the direction of flow of the water which takes place at each junction box, the total resistance to the flow is too great to allow sufficient circulation with this circulating force.

To get over this difficulty the orifices through which the water flows from the feed distributing box to the elements are very contracted, and at the bottom of each of the two downcomers is an automatic non-return valve.

With these arrangements the action of the boiler is similar to that in the old-fashioned Savery steam-pump; the water is forced into the elements intermittently by the available head of about 2 ft. instead of by the atmosphere, as in Savery's pump, the non-return valve and the contracted orifices serve as the suction valve, the steam is generated in the tubes themselves instead of in a separate boiler, and the necessity of a delivery valve is got rid of by discharging into the steam drum above the water level.

The action, therefore, is intermittent, and some water is driven backwards through the contracted orifices during the time plugs of water and steam are being pushed forward into the steam drum. The non-return valves prevent water being driven back through the downcomers into the steam drum.

When warming up the action is intermittent, as in all cases where the discharge takes place above the water-level, but in this case there is a violent water-hammer action, owing to the form of the end boxes, and to steam being generated in several of the tubes at once. Steam generated in the lowest tube pushes the water up into the upper tubes; the steam formed in the upper tubes tries to push this water back again at the same time that it pushes the water in front of it forward into the upper drum; and on this account when first raising steam the shocks are often very violent.

When properly in action the circulation is very vigorous and thorough, the alternating plugs of water and steam racing each other through the tubes of the element at a very high speed. The amount of water in the tubes is, however, very small, excepting in the lowest tube of each element, which contains much more than any of the others. The circulation in the lowest tube of the element is least thorough, and is partly alternating.

Model of Yarrow Boiler. (Fig. 6.)

It will be observed that one-half of this boiler is arranged with the tubes discharging below the water-level, as in actual boilers of this type, and the other half with tubes discharging above the water-level. An external downcomer is provided for each half, and a plug is provided so that the downcomer for the drowned tubes may be closed. Either half of the boiler may be used separately.

(1) Action with the submerged tubes and with the downcomer shut off.

As soon as the fires are lighted circulation commences, and when boiling first begins, plugs of steam and water are periodically projected into the upper drum, causing a considerable disturbance of the water-level there. When the boiler is working at a high rate of evaporation, the discharge from most of the tubes is practically continuous, and the disturbance of the water-level not so violent. Some of the tubes, which are not as highly heated as the rest, act as downcomers, while in some others the flow is alternating in direction. When the external downcomer is used an improvement is observable in the general circulation; there is less alternating flow, but some of the tubes still act as downcomers.

When the other half of the boiler is used, in which the tubes discharge above the water-level, there is, of course, no circulation until boiling begins, but on this account steam begins to be formed in the tubes nearest the fire almost immediately after the heat is applied.

This steam projects the water in the upper part of the tubes into the steam drum, cool water flowing from the drum through the downcomer to take the place of the water thus discharged. The action during warming up, then, is of an intermittent character, but, as the average temperature of the water in the whole boiler is increased, the intervals between the discharges become less and less, and when the boiler is working at a high rate of evaporation the action is quite continuous. Each half of this model consists of 16 tubes, in four rows, each tube being 7-16 in. internal diameter, and the tubes in the different rows are opposite the spaces in the other rows.

The internal diameter of the downcomers is 15-16 in., therefore the area of each downcomer is equal to 1-3·4 of the area of all the tubes served by it.

Model of Thornycroft Boiler. (Fig. 7.)

This consists of 12 tubes, 7-16 in. internal diameter, with a downcomer 1½ in. diameter.

The area of the downcomer is therefore approximately equal to the area of the tubes served by it.

When heat is applied to this boiler, an intermittent discharge of plugs of water is almost immediately set up, due to formation of steam in the tubes, although the water in the upper and lower drums is practically cold. This action is obviously of great service in preventing overheating of the upper portions of the tubes, which, before this action commences, do not contain water. In actual boilers of the *Daring* type, with internal heated downcomers, circulation of water between the drums will be started through the downcomers as soon as the fires are lighted. As before remarked, at high rates of evaporation, even with tubes below ½ in. in diameter, the water and steam do not follow each other in plugs; the upper halves of the tubes are more or less filled with coarse foam, to the complete exclusion of continuous water.

Under these conditions the circulation is wonderfully active, and the water part of the foam is projected in a continuous stream right across the steam drum, as shown, the steam being given off freely, and the water-level is only very slightly disturbed.

Model of Babcock Boiler. (Fig. 8.)

This model consists of three tubes, each $1\frac{7}{16}$ in. internal diameter, and the distance between the centres of the headers is 33 in. The tubes are inclined at 15 deg. to the horizontal.

The circulation in this case is due partly to the entraining action of the bubbles moving through the inclined tubes, partly to the foam filling the upper ends of these tubes, but mainly to the column of foam in the front header. When the level of the water before starting is below that of the bottom of the steam drum, a much smaller drum may be used, without priming taking place, than when the water-level is above.

When the water-level before starting is below the bottom of the steam drum (see Fig. 8, line A B), as soon as the boiler has got into full action a large amount of water is carried up into the drum along with the steam, and there is a continuous and very rapid flow of water along the bottom of the drum, as shown.

Model of Niclausse Boiler. (Fig. 9.)

In this model there are five tubes, each 1 in. internal diameter and 18 in. long. The internal tube is 3-8 in. internal diameter, and the inclination is 15 deg. The action is practically the same as in the Babcock boiler.

Effect of Inclination of Tube on Velocity of Circulation.

When each tube draws its supply of water directly from the water drum, and discharges it directly into a steam drum, the greater the inclination of the tubes to the horizontal the better the circulation. If the tubes draw their supply from, and discharge their steam into, headers, the inclination of the tubes does not greatly affect the circulation, providing it does not fall below about 15 deg., and providing the currents from the different tubes do not interfere with each other. This is because the circulation in boilers of this type is mainly due to the low density of the foam in the upper part of the front headers. When the inclination is much below 15 deg., no matter whether the supply of water to the tubes is from a back header or is by means of internal tubes, the circulation is largely local, and the amount of water in the tubes is very small.

When the tubes are only slightly inclined to the horizontal, the only safe way of preventing the water being driven out of them is to use a non-return valve, or a very contracted orifice at the lower end of each tube: with a non-return valve the tubes may be quite horizontal.

Relative Advantages of Above and Below Water Delivery of Steam.

When the discharge takes place just at the water-level, it seems evident that the velocity of circulation must be a maximum, because the head of water effective for circulation is the same, whether the discharge takes place at or below the water-level. In the latter case, however, part of the energy due to this head is expended in giving motion to a considerable body of water in the drum, and the velocity of circulation through the tubes must necessarily be less than when the discharge takes place at the water-level. If tubes are carried much above the water-level the circulation is, of course, reduced in these tubes.

When the discharge takes place above the water-level the area of the downcomer is constant under all conditions, but when the discharge is below this area varies even when external downcomers are used, because the number of tubes acting as downcomers varies with the rate at which steam is being generated.

When the discharge takes place above the water-level a much smaller drum may be used for a boiler of a given power, and priming is less likely to take place, because the water-level in the drum is only very slightly disturbed, whereas when the discharge takes place below the water-level the disturbance is considerable.

Should straight or curved tubes be used?

From what has been said in connection with the action of the boilers when the fires are first lighted, it will be evident that when the discharge is above the water-level, some parts of the boiler may be at a very much higher temperature than other parts. From this it seems to follow that, when the discharge is above the water-level, provision must be made for free expansion of the tubes, either by bending them, or by leaving the ends free, as in the boilers of Belleville and Niclausse. When the discharge is below the water-level, the temperature throughout will never differ much from that of the water, providing the circulation is good, and in this case straight tubes may be used without difficulty.

The author has found, by calculation, that when evaporating at the rate of 20 lbs. of steam per square foot of heating surface, the difference in temperature between the inside and outside of the tube is only 2·6 deg. Fahr. for each 1-16th of an inch in thickness of the tube in the case of steel. The temperature of the metal will, of course, be a few degrees above that of the water, but the more rapid the circulation the less the difference in temperature between the water and the tube. When working at the above rate, if the water be entirely driven from the heating surface for one second, and the thickness of the tube is 1-8th of an inch, the rise in temperature in that time will be less than 10 deg. Fahr.

Assuming a difference of even 100 deg. Fahr. between the temperature of some of the tubes and that of others, the difference in length in the case of a tube 5 ft. long due to this difference in temperature would be only ·04 of an inch. If the external diameter of the tube be 1 1-8 in, and its thickness 1-8th of an inch, the force necessary to prevent any increase in length due to this increase in temperature is 3·15 tons. This corresponds to about 8 tons per square inch of the metal, which is sufficiently below the limit of elasticity of mild steel to prevent injury to the boiler, even should the above unlikely difference of temperature ever exist between the different tubes of the boiler.

By using bent tubes it is possible to obtain a much larger amount of heating surface for a given number of joints, and a given amount of space occupied by the boiler.

Relative Advantages of Heated and Non-Heated Downcomers.

With a given rate of evaporation from a given amount of heating surface, the greatest velocity of circulation will be obtained when all the heat is supplied to the upcomers; but if additional heat be applied to the downcomers, the velocity of circulation will be increased, so long as the amount of heat supplied to the downcomers is insufficient to generate steam with sufficient rapidity to nearly exclude continuous water at some part of the downcomers.

In all these models the velocity of circulation is increased by applying a moderate amount of heat to the downcomers.

For this reason it is probable that the circulation in the Thornycroft boilers is more vigorous in those of the *Daring* type than in those of the *Speedy* type.

In boilers where the discharge takes place below the water-level, as in the Yarrow, Normand, Babcock, D'Allest, &c., even when special external downcomers are provided some of the tubes most remote from the fire act as downcomers.

In connection with downcomers it is important to note that the entrance to the downcomers ought to be removed as far as possible below the surface of the water in the drum, otherwise the reduction in pressure just inside the upper end of the downcomer may be sufficient to cause steam to be generated in it at that part. The steam thus formed would, of course, be condensed on its way down by the increased pressure. This action is indicated in Fig. 11. In connection with internal heated downcomers, insufficient attention has, I believe, been paid to the advantages of a few tubes of larger diameter being placed in the midst of tubes of smaller diameter.

Determination of $\frac{\text{Weight of circulating water}}{\text{Weight of feed water}}$.

When considering the best method to be adopted in order to determine this ratio, the author first thought that the best arrangement would be by means of a circular thin-lipped orifice, of known dimensions, placed near the top of the downcomers, but it soon became evident that although this method might be adopted for cases where the discharge takes place above the water-level it could not be used in cases where the discharge is below the water-level, because in these cases some of the tubes act as downcomers, no matter how large the external downcomer may be.

In order to get over this difficulty, the author used the model illustrated in Fig. 10, which consists of only one upcomer and one downcomer. By means of the loose glass tube shown attached to the brass rod in the steam-drum, the discharge may be made to take place above the water-level.

After trying various methods for measuring the circulation it was found that the simple water column pressure gauge was the most convenient, and of sufficient accuracy for present purposes.

In Fig. 10 this is shown attached to the top of the lower drum, another column being attached to the bottom of the steam drum as shown. The head available for circulation is the difference in the heights of these two columns, and the velocity of the water in the downcomers is proportional to the square root of this difference of levels.

In connection with this, it is important to remember that this difference of level may be increased, either by an increase in the velocity of circulation, or by an increase in the resistance to the flow of the water from the upper to the lower drum.

The following results were obtained with this apparatus when working at atmospheric pressure and evaporating 13 lbs. of water per hour. The evaporation per hour per square foot of heating surface actually subjected to flame being 10·8 lbs.:—

Area of Downcomer.	Depression of Water Column.		Weight of Circulating Water. / Weight of Feed Water		Remarks.
	Discharge above.	Discharge below.	Discharge above.	Discharge below.	
sq. in.	in.	in.	lbs.	lbs.	
·087	21	18	40	37	
·359	8¼	7½	147	138	The difference between these two readings was so small that it could not be read.
·994	3¼	3¼	242	242	

By means of the glass-tube extension to the upcomer, it was possible to take the readings of the columns when discharging above, and when discharging below the water-level, immediately after one another.

To determine the weight of circulating water in each case, separate tests were made for each size of downcomer with the upcomer disconnected, and the outlet from the bottom drum contracted to give a suitable difference of level between the columns.

Water at about 200 degs. Fahr. was then syphoned into the upper drum, and the weight of water flowing down the downcomer per minute, and the difference of level of the column being obtained, it was possible to determine, with considerable accuracy, the weight of circulating water under the actual conditions of working as given in the above table.

When I commenced to write this paper my intention was merely to describe the action in the various models shown, but as practically the whole of the problems connected with the design of water-tube boilers depend on the nature and amount of the circulation under various conditions, I was gradually led into a discussion of some of the most important problems which are affected by the circulation.

THE LONDON AND EDINBURGH SHIPPING CO.'S S.S. "FINGAL."

We give this month a page-plate illustration of the s.s. *Fingal*, the latest addition to the passenger service between London and Scotland. The *Fingal* belongs to the London and Edinburgh Shipping Co., Leith, and is the fastest and most powerful of any of the passenger steamers plying between England and Scotland. She was built (from designs supplied by the company), by Messrs. W. B. Thompson & Co., shipbuilders and engineers, Dundee. The principal dimensions of the vessel are:—280 ft. between perpendiculars, 35 ft. beam, by 19 ft. 3 in. depth; with engines indicating over 5,000 H.P., the diameter of the cylinders being 32 in., 49 in., and 80 in., all having a stroke of 48 in., and a working pressure of 175 lbs. She has two large double-ended boilers, with six of Fox's corrugated furnaces in each, also an auxiliary boiler, that can be used along with main boilers when driving at full power. The boilers are all constructed to work under ordinary circumstances with natural draught, and are also fitted for working with forced draught when required. When launched she was fitted with an experimental propeller, having a cast-steel boss, and four cast-iron blades, and on trial trip she attained a mean speed of 17½ knots per hour, the engines making 92 revolutions, and indicating 4,650 H.P. She has since been fitted with a set of new blades made by the Manganese Bronze and Brass Co., London, from designs supplied by the owners of what they considered an improved pitch and surface. After these blades were fitted the vessel was taken out for a trial run on the Firth of Forth, and on the measured mile attained a mean speed of 19 knots. She was then steamed from Leith Pier to St. Abbs Head, a distance of 40 miles, making the run down in 1 hour 56 minutes, and coming back in 2 hours 3 minutes, thus doing the 80 miles in one minute under 4 hours, which was considered highly satisfactory. The engines developed 5,100 H.P., and ran the whole distance at an average of 101 revolutions per minute. After going on her station she made some splendid running last summer, her record passage from Gravesend to Leith being 22½ hours. She was built under the superintendence of Mr. R. Young, the company's superintendent, and is commanded by Captain Howling.

The ship is fitted up with all the latest improvements for the comfort and convenience of passengers, and is fitted throughout with the electric light, electric bells to all the staterooms, communicating with the steward; there is also a music-room on the poop deck, fitted up in a most elegant style, and having a magnificent Collard & Collard piano, supplied by Paterson & Co., Edinburgh, for the use of the passengers; the smoking-room is fitted aft, away from the saloon entrance, and has all the requirements for the comfort of those who patronize it; the second-class cabins are placed forward, having ladies' and gentlemen's cabins, dining-room, &c., the engineers and officers are accommodated amidships under the bridge.

The company's head office is at 8 & 9, Commercial Street, Leith, and the London office at Hermitage Steam Wharf, Wapping. The company has other three full-powered steamers, and have three sailings weekly, from Victoria Dock, Leith, every Wednesday, Friday, and Saturday; and from Hermitage Steam Wharf, Wapping, every Tuesday, Wednesday, and Saturday.

Iron and Steel Institute.—The annual meeting of the Iron and Steel Institute will be held, by kind permission, at the Institution of Civil Engineers, Great George Street, Westminster, on Thursday and Friday, the 7th and 8th days of May, 1896, commencing each day at 10.30 o'clock a.m

BOILER AND ENGINE FITTINGS. ANTIFRICTION METALS.

UNDER the above title Messrs. Dewrance & Co. have issued the revised 1896 edition of their copyright Catalogue of Boiler and Engine Fittings, Antifriction Metals, and Bronzes. In addition to several hundreds of illustrations the book contains some useful information on "The Theory of Antifriction Metal," and some practical hints on "How to use Babbitt's Metal."

Amongst other specially interesting productions of the firm, we notice a sectional elevation of Dewrance's Automatic Water Gauges. These are fitted with Dewrance & Hopkinson's patent automatic valve for shutting off the water when the glass breaks, and also have Dewrance's patent stuffing-box for the glass tube, a neat and ingenious little fitment, which, while allowing an absolutely tight joint to be made, prevents any torsional strain being put upon the glass when screwing up the nut. Dewrance's patent double-plug blow-off cock is a decided improvement on the old form of blow-off cock, exposing as it did, every time it was opened or closed, the surfaces of the plug, seat, and packing to the action of the dirty water, an action which, sooner or later, cuts away the hardest metals. The new cock has one plug within the other, the outer one bearing against the packing, while the inner plug cuts off the rush of water, but need not be tight. In operation a hollow box spanner is put on first, and the outer plug turned full open, the inner plug remaining shut. A second spanner is then passed down inside the hollow one, and the inner plug is opened to the required extent for blowing off, which being effected it is then shut off again, and the outer plug afterwards turned off. By this means the plug that is relied upon to be tight is protected from the cutting action of the dirty water. The double plug arrangement is also fitted to scum cocks, but in this case the spanners are replaced by a pair of handles.

The latest types of Dewrance's Patent Asbestos Packed Counterbalanced Cocks are also illustrated in the present catalogue. In the body of these cocks grooves are formed surrounding the ways, and into these grooves indurated asbestos is caulked and cemented in place. Asbestos indurated in accordance with the firm's patent is not injured by the heat of steam at 250 lbs. pressure, and cannot be blown out of the grooves The plug does not touch the metal surfaces of the shell, but works entirely on a non-metallic bearing, thus preventing the abrasion caused by a metallic contact and providing for an unequal expansion. In these cocks the stuffing-box does not take any of the thrust caused by the pressure acting on the plug, and there is, therefore, no bearing upon and compression of the packing, the whole of the thrust being taken by a plate outside the gland. The plate rests on a shoulder on the plug, and by means of suitable studs and nuts the plug is adjusted to its bearing, and being metal to metal this adjustment does not alter. In this valve the pressure is admitted to the space between the plug and the cover, and this, with the holding down plate, entirely and permanently counterbalances the upward pressure, and when the plug is properly adjusted it will not rise off its bearing.

These and other of the firm's special productions have, we understand, been fitted by the Admiralty, over sixty of the largest steamship companies, thirty railway companies, and over three thousand of the largest users of steam power.

The book, extending to some 240 large 8vo. pages, is, with its numerous illustrations, well got up and bound, and should find a place in all large establishments.

SPECIALLY DESIGNED LAVATORIES AND BATHS FOR STEAMSHIPS.

MESSRS. MORRISON & INGRAM, sanitary engineers, of Cornbrook, Manchester, who are constantly bringing out improvements in their well-known bath and lavatory fittings, have recently been engaged upon designs specially suitable to meet the requirements of steamships, not only in economising space, which is perhaps the most essential feature, but in the elaboration of finish which has become so much a requisite in all modernly equipped first-class liners. The accompanying illustrations, Figs. 1 and 2, show a specially designed folding-up cabin lavatory, with hot and cold water supply to wash basin, and convenient arrangement for hanging a towel, whilst a small cupboard is provided for various toilet requirements. In connection with this is also a folding urinal, which is automatically flushed, whilst the door is kept open. The illustrations show very clearly the general arrangement of the lavatory, but it may be added that it is so constructed as to occupy the smallest possible space, whilst every working part is easily accessible. Fig. 1. shows the lavatory open, and Fig. 2 shows it closed, when it does not project more than 9¾ in. from the wall, with a width of 19½ in. and a height of 6 ft.

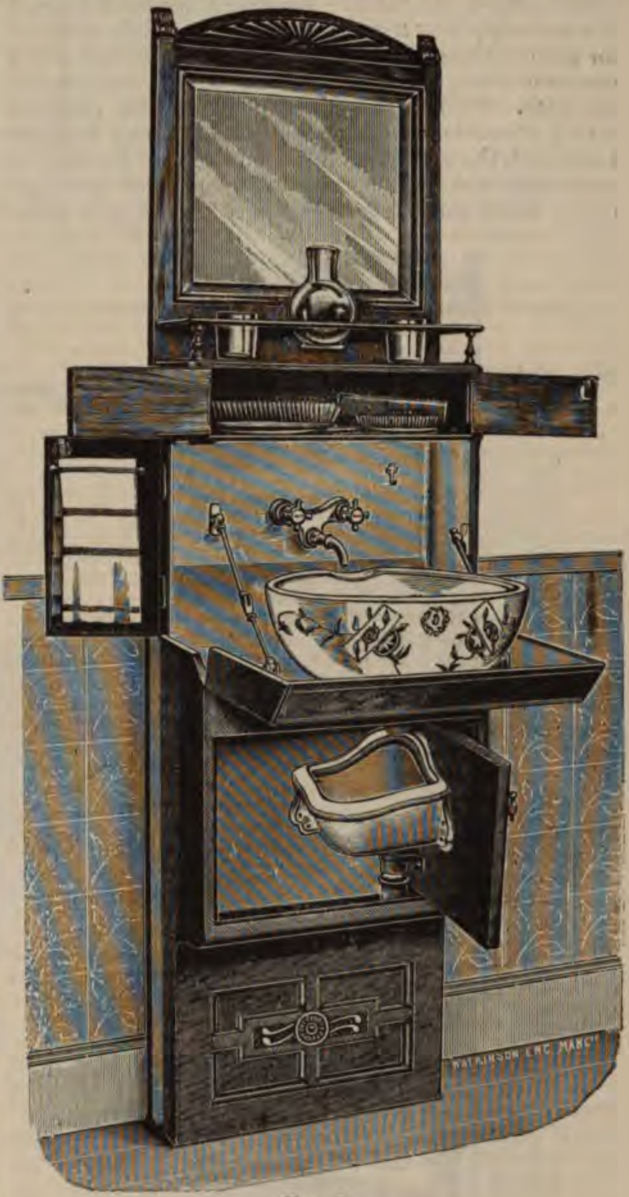


Fig. 1.

including the over-mirror. The design, however, admits of further modification, if required, to meet the exigencies of space, and it can be produced in any desired style, so as to be *en suite* with the general decorations of the cabin. Messrs. Morrison & Ingram are also supplying a concealed urinal specially adapted for use in cabins, and constructed either for fixing in a corner or along a wall side, in the most limited possible compass. Another new design suitable for cabins is a very convenient arrangement of bath and lavatory combined, shown in Fig. 3, and which can be fitted in practically the same space usually occupied by a bath alone, whilst but one installation of hot and cold water pipes is necessary to serve both bath and lavatory, which effects a considerable saving in the cost of fixing. No complication or inconvenience is caused by the lavatory being fixed over the bath, as shown in illustration, and it is obvious that, especially on shipboard, where every inch of space is a matter of consideration, the arrangement will prove of great advantage. The bath and lavatory can be finished in a variety of styles, according to requirements, and the bath is either made in the taper or parallel form to suit the necessities of the position in which it is to be placed. A very ingenious arrangement for a combined shower or spray, also douche and wave bath, has also recently been brought out, which is suitable for ship's baths, and this is shown in illustration Fig. 4. The brackets on which the arrangement is supported, are of the universal type, and can be moved up or down, raised or lowered, and moved horizontally either to right or left. All that is necessary to get either spray, shower, douche, or wave bath, is to turn the rose to the indicator marked by the name of the particular bath required. In conjunction with the mixing box taps for this combined bath, which gives either hot or cold water, as desired, an ingenious arrangement, shown in Fig. 5, has been devised, whereby a thermometer can be attached to register the heat of the water issuing, so that the person using the bath can regulate, at will, the temperature that may be required.

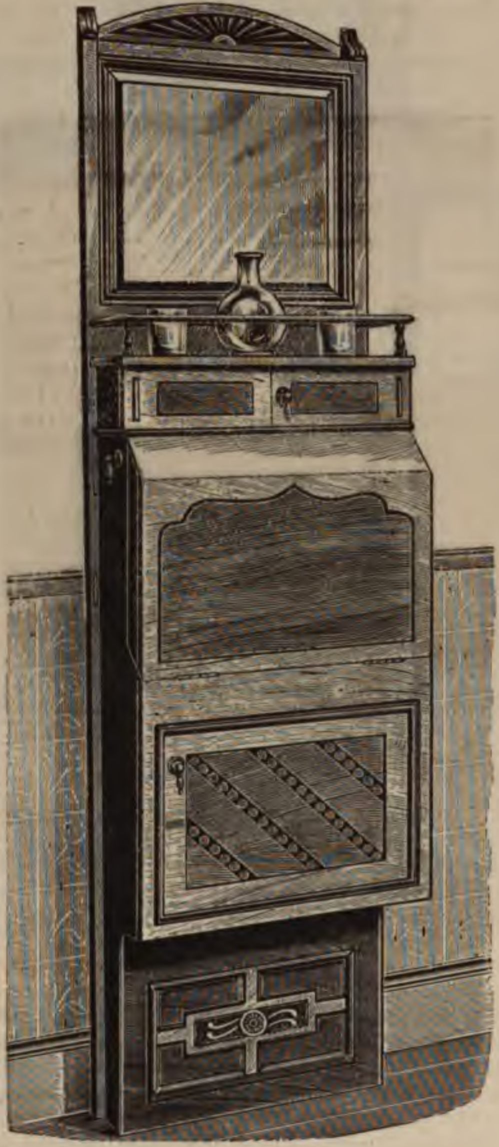


Fig. 2.

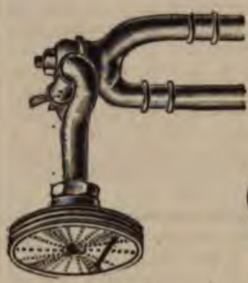


Fig. 4.

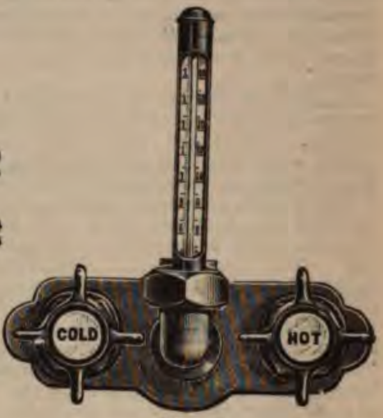


Fig. 5.

THE PHOSPHOR BRONZE CO., LIMITED.

THE annual general meeting of this company was held at the Bridge House Hotel, E.C., on March 27th, when the directors' report, and the accounts for the year, were submitted and passed by the shareholders present. Among other formal business, Mr. Francis W. C. Cumming was re-elected a director, and the re-appointment of Mr. R. Payne, F.C.A., as auditor, was confirmed.

We notice that the company have recently made considerable alterations and additions to their plant, thus enabling them to largely increase the output as well as to reduce the cost of production of their well-known specialities.

We have received from the firm particulars of the white anti-friction metals made by them, which they have produced, and for some years past sold on an increasing scale.

Instead of coining fresh names, and selling well-known compositions under a new, and frequently misleading nomenclature, the company have adhered to old denominations for well-known alloys, and merely introduced a new denominator, or generic term, to designate the valuable improvements they have made.

Broadly classed, the three alloys supplied by the firm are known as White Bronze alloys, containing tin as their chief and characteristic ingredient; White Brass alloys, in which zinc is the predominant or characteristic element; and White Antimonious alloys, in which antimony forms the hardening substance.

Subdivided, these alloys are supplied in the following qualities:—"Vulcan" brand Babbitt's metal, No. AI., II., III., IV. The first corresponds closely with the original alloy as described by the patentee, and is suitable for the lining up of all ordinary wearing surfaces. The I. and II. qualities are harder than AI., and therefore more suitable for casting solid bearings, and capable of taking a fair strain without the support of a backing in a stronger metal. The III. and IV. qualities are cheaper alloys. The plastic metal ("Cog-Wheel" brand) is chiefly used for lining up bearings, &c., and may be applied in a pasty condition to iron, steel, brass, or bronze, to any of which it will firmly adhere. It is distinguished by its particularly fine grain and superior quality.

The white brass alloys are supplied in the following qualities:—"Phosphor" white brass, No. I., for solid bearings; Fenton's metal, for solid bearings; and "Phosphor" white brass, No. II., for lining purposes only. These alloys have gained considerable reputation in connection with the lining up of bearings, and more especially for marine bearings under heavy pressures. Their high fusing point allows a considerable heating of the bearing without causing the metal to melt and run out.

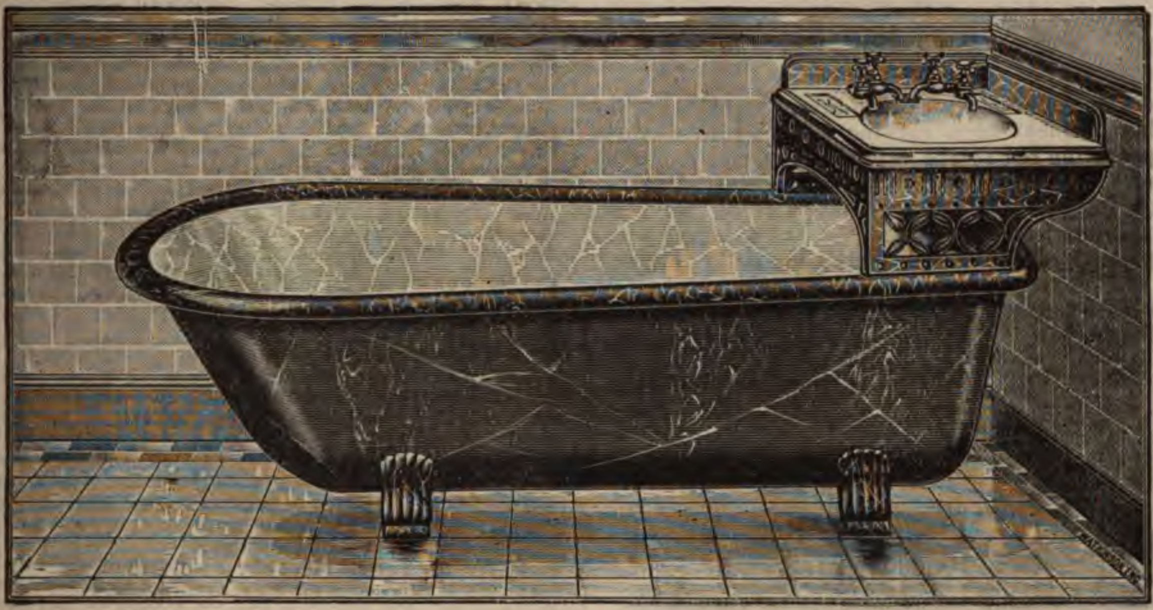


Fig. 3. Bath and lavatory combined. (*See page* 57.)

The company supply their white antimonious alloys in two, qualities only:—No. I., for lining purposes only, and No. II. for solid bearings, glands, and bushes. These are cheap anti-attrition alloys, proving their good qualities under normal conditions and reasonable pressures, and the makers feel justified from the extensive trade they do in it, in stating that their new patent "White Ant" metal, is superior to all other alloys of its class.

The makers will supply small sample ingots and further particulars on application.

Koningen Wilhelmina.—On April 11th a new steamer, the *Koningen Wilhelmina*, built for the Netherland Steamship Co., of Amsterdam, and intended for the fortnightly service between that port and Java, was launched at Flushing.

The North German Lloyd. — We are credibly informed that the North German Lloyd is asking for tenders for the construction of five new boats of 5,000 tons each for their Brazil trade.

THE BUFFALO AUTOMATIC INJECTOR.

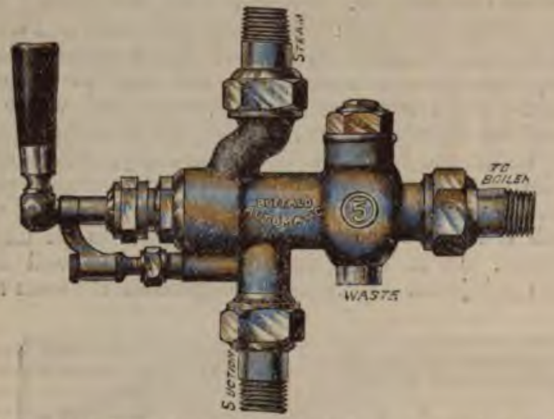
THE injector for boiler-feeding purposes, particularly as applied to steam launches, is a most useful appliance, but in its usual form is a very ticklish device to rely upon. Its two most well-known disadvantages are, first: that where the steam and water have to be admitted by separate valve movements it requires great experience in the user to properly adjust the relative supply of steam and water to produce effective action, any surplus of either steam or water preventing action. Secondly, when such relative proportion has been attained, probably after several trials, the amount fed may be excessive and pull down the live steam in the boiler to an undue extent. In endeavouring to reduce the total feed of the injector the relative proportion of steam and water is again probably disturbed and further trials have to be made for proper adjustment.

It is obvious that the mechanical way out of these difficulties is that the action of the steam and water valves should be simultaneous and the result of the movement of a single handle; the relative proportion of admissions is thus automatically regulated, and further, by reason of such automatic regulation, the amount of feed may be graded within large limits whilst still retaining the proper relative proportion of steam and water for efficient action.

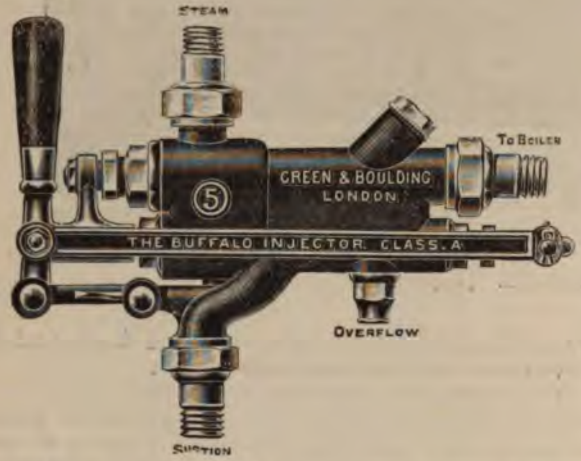
The Buffalo Automatic Injector, supplied by Messrs. Green & Boulding, of 21, Featherstone Street, City Road, London, E.C., which we illustrate herewith in two patterns, claims to fulfil these requirements for easy and reliable working, with a gradation as to the total quantity up to 50 per cent. of the maximum, thus supplying the boiler with the exact quantity required without knocking down the steam unduly.

From the illustrations it will be seen that in pattern B the injector is operated by only one push handle, which automatically regulates the proper opening of the steam supply from the upper union and the water from the lower union.

The same effect is produced automatically in pattern A, which has a double tube operated by the single movement of a rocking handle pivoted on a compensating rod to the injection casting, and connected to the valves of both tubes.



In both these injectors a gradation of 50 per cent. of maximum feed can be obtained, but the class A has exceptional efficiency with either hot or cold water, and will lift from 1 up to 24 ft., and is guaranteed to work satisfactorily under all pressures from 20 to 200 lbs.



There are no globe valves to manipulate in either the steam or supply pipe, the injector being operated entirely by one and the same handle, either for starting, stopping, or in grading the supply. It is said that no other injector fulfils these conditions, which are most important for efficient action with inexperienced hands.

The Emperor of Russia's new Yacht is a boat of 5,200 tons displacement. Her length is 370 ft., breadth 50 ft. 6 in., and depth 33 ft. 6 in. She has been fitted with engines of 10,600 H.P. Messrs. Sydney Smith and Sons, of Basford, Nottingham, have supplied the boat with steam sirens. The same firm has also supplied sirens to some Russian war vessels.

THE INSTITUTION OF NAVAL ARCHITECTS.

In our last issue appeared in full the papers read by Mr. J. Watt and Colonel Soliani, entitled respectively, "Water-Tube Boilers," and "Compound Marine Boilers" (*vide* pages 6 and 10), but owing to pressure on our space we were unable to give the discussions, but now have pleasure in doing so. A third paper was read on the same evening, by Professor W. H. Watkinson, on the "Circulation in Water-Tube Boilers."

The discussion on these three papers was opened by Mr. A. J. Durston, who felt sure that Colonel Soliani would receive the hearty commendation of the meeting for coming over and expressing his views in such an able and clear manner. He thought that great thanks were due to Professor Watkinson for his able paper on circulation, and to Mr. Watt. Referring to the latter gentleman's paper, he thought it probable that by arranging the tubes as he, Mr. Watt, suggested, with the larger tubes closest to the fire, more efficient working of a boiler would be secured, and if by so doing heating surface were lost, it would be compensated for by the increased efficiency. Referring to Mr. Watt's remark as to inconvenience in working Belleville boilers when placed with the axes of the generating tubes athwartships, and in a seaway, the speaker said that in the *Powerful* and the *Terrible* only one-third, the forward third, of the boilers are so placed, the remainder of the boilers in these ships, and all the boilers in other ships of the Navy, being placed with these axes fore and aft, and in all, about 264 boilers out of 296 are so placed, figures which showed that he and his colleagues were in favour of the fore-and-aft distribution. That Mr. Watt's fears are groundless, even when the tubes are placed athwartships, is shown by the fact that all the vessels in the Messagories Maritimes Co.'s fleet are so arranged, and these vessels make regular passages between France and new Caledonia in all weathers. As showing the worth of practical experience, the speaker referred to inquiries made on board the *Ville de la Ciotat* after her arrival at Marseilles from New Caledonia during the previous month. During her three months' voyage there was not the slightest leak in any part of her boilers, nor was any repair necessary to a single element. Referring to the *Sharpshooter*, fitted with Belleville boilers, the speaker said they had two years' experience on actual service with this vessel, during which time many long trials had been made, and no repairs had been necessary to the tubes. As a further instance, he cited another of the Messageries Maritimes boats, the chief engineer of which reported, after over 300,000 miles of regular steaming with no defects, that he was ready, if necessary, to have left again for Australia on the day after his return to France. Passing to Professor Watkinson's paper, the speaker said that this and the models he had been so good as to show them, demonstrated very clearly the circulation in the various types of boilers. Engineers were indebted to Mr. Yarrow's experiments with glass tubes for one fact which he thought they were generally not, up to that time, acquainted with, viz., that by adding heat to a downcomer tube, within certain limits, the circulation was not impeded, but actually increased; and he thought that Professor Watkinson had added materially to that information by showing them the limits within which this adding of heat to a downcomer tube must be kept. He had also stated in his paper, and the models confirmed it, that when an external downcomer is used, an improvement is observable in the general circulation, which agreed with Admiralty experience with torpedo-boats and destroyers. As regards Belleville boilers, the remark was made in the Professor's paper that it was necessary at starting to have water in all the tubes to prevent overheating of the upper ones. This might refer to the glass model, but it was not necessary in the actual boiler; and as regards the remarks that when raising steam in this boiler a water-hammer action is experienced, it was proved by practice, both in the Navy and elsewhere, that no importance need be attached to this. Referring to the assumed difference between the temperature of the metal of the boiler tubes and the water, the speaker gave the results of two experiments made to show the difference met with in practice. The first, a carefully-conducted experiment, was made on the tank boilers of the *Vulcan*; here a gauge rod was inserted to measure the difference between the expansion of a boiler tube and that of a rod near it of the same temperature as the boiler water. This difference gave the excess of temperature of the tube beyond that of the water, and it was found that when working with an air pressure of 7-10 in. of water, on a natural draught trial the tubes in the middle of the nest were a mean of 180° F. hotter than the water. Another experiment was made to ascertain the same thing in the bottom tube of one element of a Belleville boiler, and it was found that when burning coal at various rates the increase of temperature varied from 60° F. at very slow rates of combustion to 210° F. at the highest rate. This was with a clean boiler, and with dirty tubes these temperatures are liable to increase. Regarding small tube boilers, with tubes between treble plates, the speaker said it was known that tubes with little or no original curvature do bend under service conditions, and are often found to be considerably distorted.

Dealing with the question of straight *versus* bent tubes, Mr. Durston said an important consideration was also that, no matter what precautions were taken, there would occasionally be shortness of water in such boilers, and under these circumstances the resulting damage to a boiler with bent tubes would be much less than to a boiler having straight tubes.

The speaker then turned to Colonel Soliani's paper and at the outset took exception to the author modestly describing himself as a *dilettante* in marine engineering, as he believed that he had occupied the position of Engineer-in-Chief of the Italian Navy for some years before becoming Director of Naval Construction. As regards the applicability of the type of compound boiler to navy purposes, the speaker submitted that whatever advantages this boiler possessed it retained the disadvantages of large diameter and corresponding thickness of shell plates, together with large water spaces and volume of water contained. No mention was made of the pressure it was proposed to work the boiler at, but it did not appear to be suitable for pressures much in excess of 200 lbs. per square inch. The arrangement of water tubes, too, did not seem to lend itself to convenience of access to the ends of the ordinary smoke or fire tubes. It appeared that the reason given for the proposed design was to increase the vitality of cylindrical boilers and prolong the struggle between the two types of boiler even for Navy purposes, and this certainly did not appear consistent with the view that progress in the use of higher pressures was desirable. It had been publicly stated in official papers that the Admiralty were using water-tube boilers of the small tube type for vessels of the torpedo fleet; and for special ships, such as the third-class cruisers, for battleships and for first and second-class cruisers, the large tube type of water-tube boilers were being adopted. In another class of small vessel, used for what might be called river, or police, purposes, such as sloops, the speaker considered it was also desirable to use the large-tube type of water-tube boiler. One reason for this distribution of types was that the large tube ensured a fair amount of thickness to take up the wear and tear of use and work, also the size of tube admitted of easy examination and correct ascertaining of the condition of each tube, and it was considered desirable to say of such boilers that with the replacement of an occasional tube they should last three commissions of three years each at least; but with the thinner tubes of the small type of water-tube boiler it could not, according to their present experience, be guaranteed that more than three to five years of life would be got. In concluding his remarks, Mr. Durston said that he had necessarily confined his observations to that part of Colonel Soliani's paper which dealt with Navy boilers.

Mr. Yarrow commenced his remarks by expressing the opinion that the Institution was under a very great obligation to the authors of the three papers, and more especially to Professor Watkinson for so kindly showing his very interesting experiments. Referring to Mr. Watt's paper, he would like to draw attention to the evaporative efficiency of the various rows of tubes; here it would be seen that the two rows nearest the fire actually evaporated 84 per cent. of the total amount of water, while the seventh row only evaporated ½ per cent. That these large variations in the evaporative efficiency of the tubes, dependent of course upon their situation, existed was well known to those who had made this subject a matter of experiment. He, however, would submit that the rapid reduction in the evaporative efficiency of the heating surface as it, the heating surface, became more and more remote from the furnace, was occasionally not sufficiently realised in actual practice. In his firm's experience they had been frequently asked to submit designs of boilers both of the water-tube and tubular types, and it sometimes happened that a demand was made that there should be more heating surface, even if obtained by sacrificing efficiency of circulation or loss of combustion-chamber capacity. He thought that Mr. Watt's figures were useful as showing the little gain secured by any addition to the heating surface if remote from the fire. Generally, when extra tube surface is insisted on, the gain is obtained by a much larger sacrifice, due to the loss of reduced circulation or less perfect combustion. The speaker understood that Continental engineers have realised the general principles to which he referred. The Du Temple boiler, he believed, had those portions of the tubes which were nearest the fire reduced in diameter, so as to secure better combustion, although it was obtained at the loss of heating surface. As the result of experiments he believed that the capacity of the combustion chamber, and means for the proper intermingling of the gases, so as to secure the most perfect combustion, should be considered a matter of primary importance, even before the extent of the heating surface, and more particularly if that surface is close to the fire, thereby cooling the gases, putting out the flame, and diminishing the actual heat generated. The experiments carried out by Professor Watkinson were of the deepest interest and embraced more types of boilers than had been attempted before, and though they afforded a ready comparison of the rapidity of circulation in different types of boiler it must be borne in mind that all the experiments put before the meeting were carried out under atmospheric pressure, and allowance would have to be made for the altered conditions under which boilers work in actual practice. He believed the circulation would generally be more rapid and more permanent under high pressure. In his paper, Professor Watkinson referred to the increased circulation when tubes, entering the bottom of the steam drum, were carried above the water level. The speaker admitted that such was the case when the tubes were carried up in the manner described, but by carrying the tubes up into the steam drum, the difficulty of gaining access to the interior of the drum and of cleaning both it and the interior of the tubes, was greatly increased, and further, the water was much more apt to pass into the steam pipe through being driven upwards with the steam. He differed from Professor Watkinson's conclusion, that a smaller steam drum can be used when the tubes deliver at the water level; in fact, he thought that the steam drum must then be greatly increased in size and must be provided with a series of baffles. From what Professor Watkinson had said, he concluded that he had found increased circulation to be caused by the heating of the tubes in which the down-currents exist, a fact which the speaker had for some time maintained, and he was pleased to hear the author of the paper give it as his opinion that drowned tubes were, for practical purposes, all at one temperature. Those next the fire were undoubtedly subjected to greater heat than the others, but any increase of length due to this increase of heat might be disregarded. Straight tubes had been for many years successfully used in boilers of the type adopted by his firm, and the lowest estimate of the number of tubes of this kind now in such boilers he placed at 200,000, and, as far as he was aware, no injurious result had followed their adoption. Coupling this fact with the views expressed by Professor Watkinson, and the speaker thought he might confidently say that no one need fear using straight tubes in water-tube boilers if efficient circulation were insured. He held that with these tubes the advantages are secured of facility in cleaning and examining the interior of the tubes, simplicity and cheapness of construction, and convenience as regards spare gear, in addition to which was the fact that any substance getting into a straight tube would fall through it, whereas, in a curved tube it might result in the tube becoming blocked. His firm still continued to galvanise tubes internally, as they believed it increased the durability; and in a straight tube this may be done with impunity as, if any of the zinc scale falls off, it will fall through with a straight tube, but might not do so in a curved tube. The objection to the generation of hydrogen when tubes were galvanised internally was only experienced when the boiler was new, and by ordinary precautions can be guarded against.

In conclusion Mr. Yarrow referred to certain new features in boiler practice which had been recently introduced at his works, *inter alia*, expanding tubes by steam, by which a large saving of time ond money was effected: and invited members of the Institution, and especially foreign visitors, to favour them with a visit of inspection.

Mons. Normand, of Havre, dealing with the effects produced by using large and small tubes in a water-tube boiler, pointed out that Professor Watkinson's experiments showed the great difference that resulted. No doubt, said the speaker, many of the members were acquainted with the action of the steam loop: this applied to small-tube boilers, and not to those of large size, so that diameter really changed the results. Reference had been made in the papers to the fact that he used a less diameter in the lower part of his tubes, the object being to allow the flame to better penetrate among the tubes at that part. He should say, however, that he had now abandoned the practice, as he considered it dangerous, owing to the fact that anything coming down the tube would be likely to be stopped at the part where it was contracted. Regarding the difference between the temperature of the water in the boiler and the metal, he concurred with Mr. Durston that it would be very great, and the best proof of this perhaps was the fact that pure copper tubes gave out, and he considered the only proper material to use for the tubes of water-tube boilers was steel of low carbon value.

Mr. J. I. Thornycroft expressed his interest in these researches, and thought the Institution was indebted to the authors of the papers for the very interesting experiments which had been made. The speaker could only say, in regard to Mr. Watt's experiments, that his models proved too much. Taking a line from the trials carried out by Professor Kennedy, this boiler gave an efficiency greater than unity, which they could not be expected to believe. He regretted that the breakage of tubes had marred the full value of Professor Watkinson's experiments, especially as it was his own boiler that had suffered. He thought the experiments on the heating of the metal of tubes showed an amount of expansion which he should not have expected. The experiments proved, however, the difficulties met with when using straight tubes. Professor Watkinson had shown the importance in a water-tube boiler of discharging from the steam-generating pipes above the water level in order to ensure an orderly circulation. In his opinion the alternating motion of the drowned tubes gave a confused circulation, and would lead to disaster.

Mr. Leslie Robinson considered that engineers were not sufficiently precise in taking out their data in respect of heating surfaces, and pointed out that it was necessary to determine on what basis estimations should be made, and what should be the values given to areas of heating surface in the different parts of the boiler.

Mr. Thom stated that he had tried a number of experiments with water-tube boilers. In the case of a launch fitted with a water-tube boiler having internal circulating tubes, he found that the boat would run just as well after the removal of the circulating device as it did when it was present, supposing the evaporation were not too rapid. He agreed that large diameter pipes were better for downcomers, and smaller ones for upcasts, and thought that while the attention of the meeting had been confined to the flow of water and steam in boilers during the discussion, the fact that by changing the flow of gases an added efficiency of 30 per cent. could be gained had been somewhat lost sight of.

Mr. Blechynden, who illustrated his remarks by sketches on the blackboard, stated that the most important thing he had learned that evening was that experiments might in some cases teach too much, that was, it would not do to draw general conclusions from particular experiments. Turning to Mr. Watt's paper the speaker showed that by tilting the boiler the gases would not pass over the whole area of the tubes, but would proceed to the uptake or chimney in vertical lines, thus leaving a part of the boiler almost unaffected, and more especially would that be the case when the flow of gases was limited, as doubtless occurred in the experiments. With regard to the efficiency of the inner and outer rows of tubes, that would depend upon the nature of the gases. Circulation depended upon the amount of water in the tubes. It was a fallacy to suppose that copper was more effective as a heating surface than iron or steel; copper, even when clean, was not so good a conductor as iron.

Professor Lambert observed that Professor Watkinson had stated that, with a given rate of evaporation from a given amount of heating surface, the greatest velocity of circulation would be when all the heat was supplied to the upcomers; but if additional heat were applied to the downcomers, the velocity of circulation would be increased, so long as the amount of heat supplied to the downcomers is sufficient to generate steam rapidly enough to nearly exclude continuous water at some part of the downcomers. By this statement a limit was fixed, but the speaker pointed out, and showed by a diagram on the blackboard, that the limit was not attained in actual practice. The speaker then referred to Professor Watkinson's paper giving the causes of circulation. First came the difference in density of the water due to difference of temperature. Next they had the case of isolated bubbles, the continuity of the water column not being broken. The circulation, the author said, was then mainly local, and was due to the entraining action of the bubbles of steam rising through the water, and finally there was the case of the generation of steam being so rapid that part of the generating pipe was filled with steam or water, circulation was then due to the difference in density between this steam and the continuous water in the downcomers. He agreed to the first and third causes, but he questioned the accuracy of the second case, and was of opinion that the force of circulation was in all cases due to the difference in weight of the up and downcomers, and not to entraining action. The bubbles rose from internal action, and had therefore equal and opposite forces, which could not cause movement of the water column as a whole.

Mr. C. H. Wingfield differed from Professor Watkinson in his consideration that a loss of head was caused by the presence of bubbles in those parts of a boiler tube filled with foam, but not by bubbles which were sufficiently separated to allow the column of water to be continuous. He thought no such distinction should be made, and proceeded to illustrate his views by sketches on the blackboard, which space prevents our reproducing. The speaker, in concluding his remarks, said that with a given rate of steaming the liability to overheating was quite twice as great without special downcomers as it was when they were present.

Professor Watkinson, in his comments on the other two papers, said, regarding Colonel Soliani's proposals, that he always looked upon the great weakness of the water-tube boiler as being due to the fact that tubes could not be plugged without letting down steam and emptying the boiler, but its redeeming feature was the small quantity of water it contained. On the other hand, Colonel Soliani's boiler contained a large quantity of water, and it was not possible to plug the tubes. Mr. Watt, in his paper, said the outer rows of tubes were of very little use. This, the speaker thought, was a common mistake, for, except in regard to the radiant heat, the great velocity of the issuing gases pretty well equalised the value of all the tubes.

Colonel Soliani, in his reply, said there appeared to be still something wanting in water-tube boilers, and he thought that the compound boiler gave certain advantages which would prepare the way for the more extended use of the water-tube type of boiler. He was an advocate of water-tube boilers, and they were an undoubted success in small, fast vessels, and for craft of this type he would use a pure water-tube boiler; but for larger vessels he preferred a compound boiler, as the latter had the advantage of being able to get large powers with few boilers. Taking, for comparison, the *Powerful* and *Campania*, having engines of nearly equal power, they found 48 Belleville boilers were required to do the work that was obtained from 12 return-tube boilers. The speaker begged, in conclusion, to express his grateful thanks for the kind welcome he had received from members of the Institution.

Mr. Watt, in his reply to the discussion, observed that the experiments described in his paper were carried out with the same fairness throughout. Referring to Mr. Blechynden's remarks about the gases not effecting certain parts of the heating surface when the boiler was tilted, he would like to say that this had occurred to him, and to overcome the defect he had tried placing the funnel in different parts of the uptake. He must say that the results obtained were not surprising to him, as he recognised that it was not possible to get the same duty out of a given area of heating surface with vertical pipes, as with horizontal pipes, and his experiments proved this.

Professor Watkinson, in his reply, referred to Mr. Durston's statement of the great difference in the temperature of tubes, and wished to point out that in his opinion there was probably very bad circulation. The proper way to test the conductivity of metal was by means of a long rod taking the amount of heat passed through it. The speaker, having regard to the fact that the hour for adjournment had considerably passed, said that he would reserve his reply to the other critics of his paper for publication in the Transactions, and the usual vote of thanks to the authors of the papers having been proposed by the president and passed, the meeting adjourned, the members separating with the intention of next meeting at Hamburg.

Discussion on Mr. Seaton's paper.

The discussion on this paper was opened by Mr. Milton, of Lloyd's, Sir John Hay being in the chair. The speaker said there had been papers dealing with fractures of steel on previous occasions, but this was the first showing that the cause might be revealed by the microscope. It was an important point especially in regard to shafts, for it was annoying after preparing a shaft to have to cast it aside. The author had directed attention to the researches of Professor Arnold, who had confirmed Dr. Sorby's researches, and demonstrated the causes of the peculiar behaviour of alloyed metals when under mechanical treatment, and the speaker would like to ask whether annealing without work showed its influence by microscopic examination; he had found copper brittle when unannealed, but when annealed it possessed the usual ductility. Referring to the shaft in question he was surprised that such good mechanical tests were stood as the chemical analysis showed it to be of such bad material. The speaker did not agree with the author that to bore out the centre of the shaft rendered it much safer, as it removed that part of the forging liable to be of inferior material, and in which disintegration would most likely commence. It might be true with shafts such as figured in the first illustration, where the disintegration commenced from the centre, but supposing the shaft were like the second one illustrated, in which the weak part is near the circumference and the sound metal in the centre.

Mr. Hall, of Sheffield, was speaking, when the Earl of Hopetoun entered and replaced Sir J. Hay in the chair. Referring to Mr. Milton's surprise at the shaft doing so well as it had, the speaker did not think the results at all unusual. As a practical steelmaker he knew that ingots will pipe, but the good steelmaker casts his ingots long enough to cut off the pipe, and with it the sulphur and carbon which, owing to its remaining liquid the longest, would congregate there. In regard to annealing he would say good steel could not be spoiled by judicious annealing, and thought there was as much need to anneal forgings as castings. Speaking generally on the trustworthiness of steel shafts, he would point out that the one referred to was made in 1883, at which time steelmakers did not know as much as they do now, and though the shaft was as bad as it well could be, it had stood a good many years, and with increased knowledge and modern improvements, no good steelmaker in the present day would turn out a shaft as bad as this. Though Mr. Seaton said he was somewhat sceptical of the fatigue theory, he, the speaker, had in his paper on "Fractures in Steel Shafts," referred to cases in which it had been found that shafts of good material had broken, after years of work, and he could see nothing to account for it but the theory of fatigue. He was glad to hear what Mr. Seaton said about the use of the microscope, and thought there was a great future for it in the examination of steel.

Mr. Thornycroft considered the Institution greatly indebted to the author for impressing on users of steel the value of the microscope, and thought this method of investigation might be extended to other materials, and he would like to ask whether anything had been done in the examination of gun-metal. He trusted this manner of investigation would be followed up.

Mr. Ellis expressed his appreciation of the good work Professor Arnold had done, and thought the discussion valuable in that it brought the steelmaker and user into contact. His company (John Brown & Co., Limited) had been using the microscope for many years, and he could bear testimony to its value. He thought the bad analysis of the shaft was due to a pocket in which the objectionable materials had collected. As to alarming the steel user by the revelations of the microsections, which showed lines of weakness, he would point out that, although the pictures were of good size, the particles of steel they represented were very minute.

Mr. Manuel told how his company (the P. & O.) had been using steel shafts since 1881 without a single breakage or discovering a sign of fracture, and he did not now, after 14 years, feel inclined to go about, as was proposed, with a microscope in his pocket looking for flaws. The use of the microscope was not, however, new to him. Since 1881 he had put 110 steel shafts in vessels, and he did not fear using steel, as one shaft had run nearly a million miles, and was still good. He quite agreed with what the author said about fatigue, but he did not agree with cutting out the middle of the shaft, for his experience was that shafts break down from the outside, and not from the middle. He would point out that in microscopic investigations only a minute part of the metal was taken, and he did not think it justifiable to condemn the whole on the testimony of that minute part.

Mr. Hall here remarked that by fatigue he meant the effect of continuously bending metal in one direction and then another.

Mr. A. Denny considered Mr. Manuel's shafts stronger than many persons thought necessary. He would like to see hollow shafts universally adopted, as when the hole was made in the middle they were able to make up to the full section in order to give the required strength, by adding to the diameter outside, in addition to which the boring-out gave facilities for inspection.

Mr. R. Matthews thought the analysis of the shaft would lead one to suppose that it was made from the remains of steel castings, and had taken in all the dregs. The proper way to make such a shaft was by the hydraulic press, and not by hammer. It was the practice of his firm (Whitworth & Co.) to anneal a forging for a shaft, then turn it, and then anneal again. The formation of the collar was also important; they did not make their shafts as large diameter at the end as the collar had to be, and then turn them down; but they upset the end, so as to get the fibres of the metal running from the shaft into the flange, so obtaining the full strength of the metal. Regarding what had been said about fatigue, he thought a shaft, like a man, had a given capacity for work, and that you could not expect to get long life out of poor material.

Professor J. O. Arnold feared, from some remarks of Mr. Manuel's, that his report to Mr. Seaton was not as clear as it should have been. He, Mr. Manuel, had imagined himself going about with a pocket microscope, but the speaker assured him he would want something very different wherewith to carry on such an investigation. Mr. Milton had asked whether the microscope would reveal annealing. Mr. Seaton had examinations made (not by the speaker) which showed this In the unannealed sample the casting was seen to consist of particles of steel and iron laid alongside each other; after annealing they were no longer side by side, but interlocked. He did not think the difference due to annealing could be due to molecular changes, but to inter-crystallization. With regard to fatigue, his idea was that it was due to the gradual loosening of crystals in the metal. Mr. Matthews had spoken of a homogeneous metal, but he did not think such a thing existed, certainly it did not exist in the form of steel shafts, all of which, as the microscope showed, consisted of particles of iron and steel alongside each other.

Mr. Seaton, in his reply, said it had been stated that the shaft referred to had passed the Board of Trade and Lloyd's. Undoubtedly the analysis was bad, but he would point out that neither of the two departments referred to tested the piece which goes into the ship, but tested that which did not go into the ship, and which was prepared by the steelmakers for the purpose of testing. He would test parts of the shaft itself, thus drillings for bolt holes could be utilised. Mr. Thornycroft had raised an important question about testing gun-metal with the microscope, but the speaker's interest was more with the high strength bronzes. He thought Mr. Manuel need not trouble to go about with a microscope in his pocket as his shafts were always made strong enough to relieve him of any anxiety, even if they were made of cast-iron they would probably stand their work. He thought his paper ought to allay any scare on the part of steelmakers, for if a shaft so inferior in composition did its work for so many years, how very trustworthy steel shafts as now made should be found. Referring to Mr. Matthew's contention for the use of the press, the speaker said no one doubted but that very perfect forgings were turned out by the big Manchester firm, but some makers still say that a hammer is best for the purpose. He would not enter into the question, which was purely one for the steelmakers, whether hematite ore was good or not for making steel for forgings, he was not informed on the question, but he must confess he was surprised to hear that material condemned. However, he might tell Mr. Matthews that the firm which supplied the shaft referred to in the paper professed to use nothing but Swedish iron.

Discussion on Captain Little's Paper.

Before this paper was read the Earl of Hopetoun informed the meeting that he had been summoned to a conference with Mr, Goschen and must therefore apologise to the members for running away. Previous to his departure Sir E. J. Reed proposed, and Mr. Martell seconded, a vote of thanks to the noble President for his conduct in the chair. His lordship having suitably replied, Sir E. J. Reed took the chair, and the reading of the paper was proceeded with.

Mr. Martell, in opening the discussion, said that disaster to grain-laden ships more often occurred through bad proportions than from the causes referred to by the author. The fault had been that beam was too small as compared to depth. To show that the figures given in the paper were not applicable to the present time, Mr. Martell pointed out that one of the ships quoted, 20 years old, was 284 ft. long, 34 ft. beam, and 26 ft. deep. No one would ever think of building such a vessel today. Happily, the losses of mercantile ships were decreasing continually, and one cause for this was the better proportions now adopted, and another cause was the load-line Act. He could not agree with the author as to a hard-and-fast line being laid down in regard to metacentric height, and he would challenge the statement as to the safety of sailing ships; he maintained that never were sailing ships better built or safer than in the present day. Feeders he thought of service for filling up spaces under decks when grain cargoes were carried, but a better way was to take out the lower deck so that there would be no spaces below it to fill, and to make up for the loss of strength due to the absence of the deck by putting in additional strength in the hull structure.

Mr. A. Denny thought, with Mr. Martell, that it would not be wise to attempt a hard-and-fast line for metacentric height. He was pleased to find in the author one of those able sea captains, and the class was happily increasing, who took more than ordinary interest in the scientific features connected with the vessels they had to command.

Captain Law instanced the danger that frequently arose from the ventilators being washed away from the decks of grain-laden vessels and so allowing water to get into the cargo. More ships were lost, he thought, from this cause than from the shifting of the cargo. Of course ventilators were necessary for coal cargoes, but he did not think them essential for grain.

Captain Little having briefly replied, the meeting terminated with the usual votes of thanks.

The discussion on Mr. R. E. Froude's paper on "The Non-Uniform Rolling of Ships" was, as might be expected from the title, of a more or less abstruse mathematical nature, and need not be fully reproduced by us.

Sir William White congratulated Mons. Bertin on having emulated Mr. Froude to complete the work on which he had for ten years been engaged, and announced that Mons. Bertin would contribute his reply in writing. He, the speaker, thought this the most important paper they had had for twenty or twenty-five years. He considered the paper extremely valuable to naval architects, because it classified and summarised all work done before, and then carried the problem beyond the limits hitherto reached. In the course of his remarks Sir William told how, in his experience on the point of observation, the waves frequently failed to assume those gracefully rounded curves shown on the diagrams, the surface of the sea being more often like a confused series of pyramids.

Mr. Thornycroft said the paper pointed to the desirability of those at sea recording their observations so that students of wave motion might give effect to what would be likely to happen in the case of a ship amongst more complicated wave systems.

Professor Biles thought that the paper opened up a new field and it would be studied with advantage, for ship-designers were apt to get too much into the way of thinking they knew all about rolling. The speaker instanced some curious rolling motions he had observed with a ship having a negative metacentric height, he had made calculations and found her perfectly safe.

Mr. Froude having briefly replied, the next—an even more advanced mathematical—paper, on "A New Theory of the Pitching Motion of Ships on Waves, and of the stresses produced by this Motion," was read by the author, Lieutenant A. Kriloff.

Professor Biles, Mr. Froude, Mr. A. Denny, Professor Greenhill, and Sir E. J. Reed took part in the discussion of this paper, the latter expressing his grateful thanks to the author for the information the paper afforded.

Lieut. Kriloff, having thanked Sir E. J. Reed for his kind expressions, proceeded, with the aid of sketches on the blackboard, to deal with certain points raised in the discussion of his paper.

In the absence of the author, Mr. C. E. Stromeyer's paper on the "Measurement of Feed and Circulating Water, &c., by Chemical means," was read by the secretary.

Mr. Shonheyder, in opening the discussion, said that the methods proposed would be useful for measuring large quantities of water, but he considered it inferior to measurement by the drum weir, the latter enabling the quantity of water passing to be seen at any time, whereas by the author's system, samples had to be taken and analysed. The author said that the chemical system he proposes gave a difference from the meter readings of 5 per cent. On board ship they required an apparatus which was not interfered with by the motion of the ship, and he found he could get with a meter an accuracy of indication within 1 per cent. of absolute truth, and further, meters could be read by ordinary engineers, whereas chemical analysis required special knowledge. Mr. Stromeyer had said that on account of the air which is mixed with the feed water, when the pumps are worked by the main engines, meters would not give accurate results. The speaker provided a valve to let the air out continuously and he found that the error was within 1 per cent. Of course, if a large volume of air had constantly to be dealt with he would provide special means for extracting it. Mention had been made in the paper about the difficulties attendant upon pumping hot water, but he had gone as high as 296 deg. Fahr. with success.

Mr. Milton did not suppose that the author wished to fit the apparatus he described in the paper to a marine engine, but the speaker considered he might justly claim to be the first to suggest a workable method of measuring the vast quantity of circulating water used at sea. The speaker called attention to the fact that athough an error of 5 per cent. had been admitted it was not large when it was considered that the tests were made with Glasgow water, the purest supplied for municipal purposes, and he personally thought that a test which would give results with a water containing only one or two grains of salt per gallon must be considered very accurate.

Mr. Thom, of Glasgow, remarked that he had assisted at one of the trials mentioned in the paper. These trials were made to test ordinary boilers against water-tube boilers, and thus he considered the information obtained was extremely valuable. By the aid of the system suggested in the paper, they were able to get records of the amount of circulating water used—data not to be obtained by any ordinary means. He contended that meters would occupy too much space on shipboard, and, again, the pipes and connections leading to them would take up a great deal of room. The accuracy of the new process surprised him, and he was sure that all engineers would be thankful to the author for the years of study he had given to this matter, and for the amount of ingenuity displayed in carrying out the experiments.

Mr. J. G. Kinghorn's paper on "Salvage Appliances," was read by Capt. J. Bell, the author being absent. This paper elicited no formal discussion, but on the conclusion of the reading a number of models, which were placed on the platform, were exhibited in action, and afforded considerable interest to the members present. The meeting, after the usual votes of thanks, then adjourned until the evening.

"THE MORSE" VALVE RESEATING MACHINE.

IN our issue for March, 1894, we gave an illustrated description of this ingenious reseating tool, and since then we are pleased to hear that it has been extensively adopted by engineers, manufacturers, steamship owners, &c., with evident satisfaction, as the makers inform us they are constantly receiving repeat orders.

The appliance was, at the time of our description, made in three sizes only, viz., the first size to deal with valves from ½ in. to 4 in., the second size dealing with valves from 3 in. to 9 in., and the largest size sufficing for valves from 4 in. to 12 in. Owing to an increasing demand for an intermediate size, the patentees have now placed on the market a machine capable of dealing with valves ranging from 1 in. to 6 in., and this size, we are informed, has lately been in so great request that the makers have been unable to supply the orders on hand. The range of work of the tool has also been extended by a recent addition to the outfits, as the 6 in., and 9 in. machines can now be supplied with apparatus for dealing with the discs, or valves, of various descriptions, whereas formerly their sphere of usefulness was limited to the valve seats only.

The invention of Mr. Morse, the machine does its work quickly and accurately, and as it will reseat any valve, steam or hydraulic in its place, and without having to take down or in any way disturb the valve or the range of pipe, it is obvious that its use will save time, trouble, and expense, besides cutting short the loss due to leakage.

Over 4,000 firms, including the Admiralty, many of the leading steamship, railway, and hydraulic companies, and all the leading engine builders, are now using the tool, a fact which is perhaps the best proof of its appreciation. Many of these firms commenced with the small size machine, but have subsequently extended their orders up to the largest size.

All further particulars can be obtained from Mr. Richard Rankin, of 22, Manchester Street, Liverpool.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our own Correspondent.)

In the current number of the *Journal* of the Royal United Service Institution there are printed two essays, devoted to the subject of the requirements of the Royal Navy in personnel. The first of these is by Commander Honner, and won the Gold Medal of the institution; the second is by Captain Eardley-Wilmot, and took the second prize given by the Council. To our readers the portions of these essays dealing with the engineering branch of the naval profession will be the more interesting, and therefore a brief summary may be acceptable, although everybody who wishes to learn the opinions of the service on this most important question should read the essays for himself. Commander Honner gives the following table of the number of engineer officers which he estimates are required for the service of the fleet, and the number available: —

Rank.	Required for the Fleet.	Available.	Deficiency or surplus.
Chief Inspectors and Inspectors of Machinery	13	13	*nil.*
Fleet Engineers	150	105	45
Staff Engineers	135	93	42
Chief Engineers	110	74	36
Engineers	342	289	53
Assistant Engineers ...	258	182	76
Engineers for temporary service	—	15	15
Total	1,008	771	267

In addition to the above, 172 engineer students were in training at the beginning of the year. From this source Commander Honner reckons that 70 officers might be obtained, leaving a deficiency in round numbers of 170. He hopes that by the extension of Keyham College an increase of students will be possible, so that the deficiency may in course of time be made up from this source. He is opposed to direct entry, and believes, that by an addition to the pay of the engineers all difficulty in obtaining a supply of the right kind of officers would be surmounted. That the social position of an engineer has anything to do with the matter he doubts, since "a wardroom mess is a Bohemian society—taking a man for his individual worth—there is little of class caste about it." Commander Honner has not much faith in the R.N.R. engineer, nor will have until he has served a course of training in war vessels. Dealing with the engine-room artificers, "the backbone of that service," he says, "if we consider what a mass of engines, all of different types, are to be found on board a modern battleship, and only differing in degrees on the smaller vessels, we are forced to the conclusion that nowhere but in the Navy itself can such training and experience be obtained." He calculates that 2,400 engine-room artificers are needed for the fleet, and recommends the establishment of a reserve of trained men from the merchant service. He also makes suggestions for the establishment of a reserve of stokers and firemen, and reckons that by his plan, in ten years time there would be available, in addition to the 2,400 artificers and 14,000 stokers in the regular Navy, sufficient reserves to make up a total of 22,403 men of these branches.

Entry and Training of Engine-room Staff.

Captain Eardley-Wilmot does not, in his suggestions, enter into so much detail as Commander Honner, but what he has to say is very much to the point. First treating the matter historically, he passes in rapid review the means of entry and training of engineers for the Navy which have been adopted since 1838, when regulations on this subject were first promulgated. Then, after a description of the present methods, he says:—"It will be observed, however, that they (the engineers) are not brought into contact with the younger officers of the fleet until they meet in a seagoing ship. I cannot help thinking that it would bring this branch more in harmony with the others if it were recruited in the same way, and entered the service through the same channel. Let all join the training establishment, and on completion of the 18 months, or even a year, those who intended to follow the career of an engineer could undergo the further training in a dockyard, as now, instead of embarking in a training squadron, (the course he suggests for naval cadets). . . . Friendships would be formed in the training establishment, to be renewed afterwards at sea, which would tend to an increased sympathy between the branches and conduce to that co-operation between them so essential to the best interests of the service." For the engine-room artificers and stokers, Captain Eardley-Wilmot has several suggestions to make. The former grade he thinks should be reached only from the latter, as the status of a chief petty-officer in the Navy should only be reached after experience in the Navy has proved the fitness of the recipient. At the same time he would give commissions as engineers to selected men, from the artificers grade, just as he would open the quarterdeck to the seamen class. Stokers, he considers, when newly raised, should invariably go through a course of training in all classes of vessels before being drafted to ships in actual commission for service. His plan for creating an effective Reserve is very similar to that advocated by Commander Honner, and consists essentially in establishing short service alongside the long continuous service which at present obtains. By this system the continuous service man would enter the Navy for a lifetime, the short service man for a period of training, and then find his livelihood in the Merchant Marine and other seafaring pursuits, his earnings being supplemented by a retaining fee from Government, while, of course, he would be liable to be called out in case of emergency. It is believed by many people that this is the only way in which an effective reserve of seamen and stokers can be obtained, and that indirectly this system would also have the result of filling our Merchant Marine with native-born seamen, instead of as at present, a very large proportion of foreigners.

Portsmouth Dockyard.

The prescribed time for constructing the new battleship is 20 months, which will be an advance on the record which stands in the case of the *Majestic* and *Magnificent* at just under two years. The *Prince George* and the *Eclipse* will both be finished before next winter, and should be nearly out of hand by the time the new ship is begun, so that there will be a fair field for work on her. It has been decided to build a smithery between the pumping station and the new dock, an establishment which has for long been required in this part of the yard. The *Nymphe* paid off on April 2nd and the *Beagle* on April 17th. The *Barham* and *Bellona* will come here to be fitted with Thornycroft water-tube boilers. The *Nelson* was commissioned on April 14th to take a new crew to the *Trafalgar*. The *Fox*, commissioned the same day, has left to relieve the *Swallow* on the Cape Station. Overtime is being worked here, not only on the new ships *Cæsar*, *Eclipse*, and *Gladiator*, but during the last month on the coastguard vessels, *Australia* and *Edinburgh*, as well. The visit of the Lords of the Admiralty was made in connection with the business of the Naval Works Bill, and they took note of the steady advance which is being made with the new docks, particularly No. 14. The *Prince George* also came in for inspection, and although overtime is not being worked on her, such good progress has been made, both by constructors and engineering contractors, that but little doubt remains, if the armour-makers keep time, the vessel will be completed to date. It is stated that after all the dredging operations, which have been going on here for so long, the improvement in the depth of the channel is but small in proportion, and for this reason a boom defence is to be prepared at Calshot Castle to shut in Southampton Water as a secondary harbour for men-of-war in time of emergency. The *Powerful* and *Terrible* are both to come to this port for their trials and completion, and it is expected that they will arrive in June or July. No. 96 torpedo boat has been delivered here from White's yard at Cowes, and is the last boat of this class built for the Navy. The *Eclipse* is in a fair way now to be completed for the Reserve. The *Intrepid* was commissioned April 28th to relieve the *Tourmaline*. This dockyard is now at the height of its activity, for in addition to the construction work, the coastguard and training ships are undergoing refit, and the Royal yachts, such as have not been finished, are also in hand. The next ship for the pennant is the *Melpomene* to relieve the *Dædalus* at Bristol.

General Programme and Progress.

An interesting return is published in Lloyd's Register for the quarter last completed, which shows that at that date there was a total of eighty-three warships building in the United Kingdom with a displacement of 312,375 tons. Of these vessels all but nineteen are being constructed for the British Navy. Fifteen are building in the present dockyards, two battleships at Chatham, one at Portsmouth, and one at Pembroke; one first-class cruiser at Pembroke, two second-class cruisers at Chatham, two at Portsmouth, and three at Devonport. There are also two third-class cruisers building at Sheerness. Of course, under the head of building, those which are technically "completing" are included. Of the British Navy ships building in private yards, Messrs. Thomson, of Clydebank, have one battleship, two cruisers and four destroyers. Messrs. Laird have one battleship and six destroyers. The Barrow Co. (Naval Construction and Armaments) have two first-class cruisers, two second-class cruisers, and two destroyers. There are also in process of construction on the Clyde one first-class cruiser, four second-class cruisers, and one destroyer. The balance is made up by six destroyers at Chiswick, six at Barrow, two at Paisley, one at Barrow, and one at Sunderland, while Mr. White at Cowes, had still a first-class torpedo-boat on the stocks. To these vessels several more of the new programme must now be added. The four new third-class cruisers of the *Pelorus* type are to be named *Perseus*, *Prometheus*, *Pegasus* and *Pyrames*.

The Subsidised Mercantile War Auxiliaries.

Although it is now fully recognised that a merchant ship of the fast ocean liner class cannot be converted into a war cruiser, there can be no question that these vessels will be most useful to the Government in war time. The Admiralty, therefore, having inspected and passed a number of ships of this kind, their owners will as usual receive subsidies entitling the nation to have first call on their services in an emergency. The sum of £48,620 will be paid this year to the Cunard, Peninsular and Oriental, White Star, and Canadian Pacific lines. This is an increase of £3,137 on the sum paid last year, and distributed as follows, entitles the Government to the services of the vessels named: Cunard Co.—*Campania* and *Lucania*, £7,500 each; White Star Line—*Teutonic* £7,285, *Majestic* £7,396; Peninsular & Oriental Steamship Co.—*Himalaya* and *Australia*, £3,375 each; *Victoria* and *Arcadia*, £2,438 each; Canadian Pacific Co.—*Empress of India*, *Empress of China* and *Empress of Japan*, £2,437 each. The following additional steamships belonging to the above companies, are under the terms of the contracts by which the subsidies are paid, to be held at the disposition of the Admiralty in certain eventualities. White Star Line—*Britannic*, *Germanic* and *Adriatic*; Cunard Line—*Etruria*, *Umbria*, *Aurania* and *Servia*; P. & O. Co.—*Britannia*, *Oceana*, *Peninsular*, *Oriental*, *Valetta*, *Massilia*, *Rome*, *Carthage*, *Ballaarat*, and *Parramatta*. A reserve of converted breech-loaders has been set aside for the armament of these vessels in the event of their being required, and to prevent any delay those ships which happened to be abroad would find at the reserve depot on the station an armament which could be mounted at once.

Chatham Dockyard.

The dates fixed for the completion of the vessels building here are now settled. The *Victorious* will be completed next September, the *Illustrious* in June, 1897, and the new battleship in September, 1898. Of the cruisers, the *Minerva* will be finished and out of hand by July, and the *Vindictive* by December, 1897. Several vessels from private yards will come here to be fitted out. The *Jupiter* battleship from Thomsons, of Clydebank, the *Diana* and *Venus*, cruisers from the Fairfield Co., and the *Dido*, a sister ship, from the London and Glasgow Engineering and Shipbuilding Co. The refit of the *Severn* being complete, the *Leander* will take her place and in addition to refit and overhaul will receive quick-firers and a new rig. The coast guardships *Mersey* and *Galatea* are refitting, and the latter is also receiving a new armament of quick-firers. The trial of the *Monarch* was very satisfactory, a speed of from 15¾ to 17¼ knots being easily attained. The *Triton*, surveying vessel, has left to begin her summer work. The refit of the *Cyclops* is complete, and indeed by the way the work is being pushed on it is evident that the programme both of repair and shipbuilding will be carried out to date. The *Grafton* fits out here to relieve the *Edgar*, and it is reported that the torpedo-boat destroyers *Ranger*, *Porcupine* and *Haughty* will be commissioned either for service in the Channel or Mediterranean. The work on the new barracks will soon be commenced in earnest, and as a preliminary step the old Brennan torpedo factory has been given up by the War Office, and its site, like that of the prison, will be occupied by four blocks of new buildings. It does not appear to have been definitely settled whether the new hospital will be erected on ground at the eastern end of the Dockyard extension, or upon higher ground near Gillingham, but the point will probably be decided soon, as it is certain that the work will not be long delayed. It is in contemplation to supply this yard with another dock, as at present there are only four of from 400 to 410 ft. in length, and one of these is always used for building purposes. It was at one time proposed to use the north and south locks as docks, but the foundations being unsafe, this plan is now definitely abandoned.

Engineers and Stokers in the Reserve.

The well-known engineer expert, whose notes in the *Globe* on engineering subjects always attract special attention, writes:—In the opinion of most people the present Admiralty is the best we ever had, and yet it is far from perfect. For instance, Mr. Goschen has more than once asserted that the Admiralty have no difficulty in obtaining as many stokers as they want—this, of course, is necessarily not of the First Lord's own knowledge, but what he is told to say—and yet I hear from one of our most important dockyards, from a source on which I can implicitly rely, that there is a dreadful scarcity of stoker's ratings in the Reserve, worse than ever. In this particular port there are not ten chief stokers and twenty-five leading stokers, while stokers are so scarce that not a single ship can be found in the Reserve that is not below her proper "skeleton" complement. Another officer writes from a no less important dockyard to say he has not had a quiet day for ages. He is always being taken away to do testing and other kinds of work in other vessels, although he has a party of mechanics and stokers hard at work in his own ship, where his presence is sorely needed. Other senior men are taken away from their own particular duties to run trial trips and the like because the Reserve is so extraordinarily short-handed. In former times there were generally sufficient supernumerary officers in the Reserve to attend to trial trips, examinations, &c., but the day of the supernumerary engineer officers in the Fleet and Dockyard Reserve has apparently gone for ever.

Steam Trials of the "Renown."

The steam trials of the *Renown* battleship, built at Pembroke, and fitted out at Devonport, have been highly successful, and reflect the greatest credit on Sir William White, her designer, and on the manufacturers of the engines, Messrs. Maudslay, Sons & Field. The speed attained on the eight hours' trial was nearly a knot in excess of that fixed by the contract, being 17·9 knots; and on the four hours' forced draught trial, with an air pressure of only 7-10ths of an inch, the speed was 18¾ knots. The engines of the *Renown* are of the usual Navy type, and there are eight single-ended return-tube boilers. The propellers are 16 ft. 6 in. in diameter, with 21 ft. pitch. The boilers have a collective grate area of 821 square feet and a total heating surface of 28,840 square feet. There are eight fans for the supply of forced draught, and the tubes, of which there are 4,640, are fitted with the Admiralty ferrule. The forced draught trial, which took place on April 6th, gave the following mean results for the four hours:—The steam pressure was 145 lbs., the vacuum 27¾ in., the air pressure in the stokeholds (as already mentioned) 7-10ths of an inch, the mean revolutions 104 per minute, the mean I.H.P. for the starboard engines 6,340, and for the port engines 6,561, making a total of 12,901. The speed by log, verified by cross-bearings, gave a mean of 18¾ knots, the maximum being 19¼ knots. Some interesting trials are to be carried out by the *Majestic*. These trials will consist of a series of runs over the measured mile at Stokes Bay, including two of 10 knots, four at 12½ knots, four at 14 knots, four at 16½ knots, and two runs at the slowest possible speed. On the completion of these trials the battleship will steam at full speed with forced draught over a given course, making a nine hours' run, in order to determine what are the best possible results which can be obtained.

Devonport Dockyard.

The *Arrogant* cruiser will be launched here on May 26th. The *Edgar*, which is to be relieved by the *Grafton*, will come here for overhaul and repair. She has been absent since March, 1893. The new battleship will be laid down in December next on the slip which the *Arrogant* vacates, and which is to be prepared for the purpose with all possible expedition after the launch. The *Hyacinth* was paid off the day previous to Good Friday, and the *Sappho* with relief crew of *Phœbe* on the following Saturday. The *Sappho* has since been commissioned with new crews for the *Sphinx* and *Redbreast* on the East Indian station. The visit of the First Sea Lord and Controller to this yard was doubtless in connection with the progress of the new works, but their lordships took occasion to visit the *Renown*, and also to have a cursory inspection of the *Arrogant* and other vessels in hand. The *Benbow* is to have her 6 in. guns replaced by quick-firers. One of the ships which has left this port during the month is the *Northampton*, which is doing most useful work in training boys. Since she was commissioned in June, 1894, no less than 1,426 boys have joined her, and more than 1,000 have been passed into the Navy. A fair proportion of the lads have gone from the West Country, a locality which from time immemorial has had the reputation of supplying good material to the sea service. Good progress is being made with the extension of the Naval Engineering College, a new recreation ground on the site of the old Keyham lake being a great improvement on that previously existing. The new dockyard extension scheme provides for the construction of two basins, one lock, and three docks capable of taking in any modern vessel. The "A" division of the Fleet Reserve at this port has never been so full as it is now, with the following vessels and torpedo craft: — *Northumberland*, *Agamemnon*, *Bellerophon*, *Temeraire*, *Belleisle*, *Gorgon*, *Thames*, *Blanche*, *Pearl*, *Forth*, *Antelope*, *Harrier*, *Hussar*, and torpedo boats Nos. 45, 52, 53, 55, 57, and 58.

Torpedo-boat Destroyers.

The Admiralty have recently given orders for the construction of an additional number of torpedo-boat destroyers, and among them one that is to have the speed of 32 knots. This boat will be built by Messrs. Thornycroft, who now hold the palm for building the fastest boat afloat. With the four boats now ordered, this firm will have ten in hand. Of the fifteen boats ordered soon after the publication of the Estimates, the *Angler* and the *Ariel* will be built at Thornycrofts; the *Avon* and the *Bittern* at Barrow; the *Bat*, *Chamois*, *Whiting*, *Crane* and *Star*, by Palmer's Co., at Jarrow; and the *Earnest*, *Griffon*, *Locust*, *Panther*, *Seal* and *Wolf*, by Laird's, of Birkenhead. All these boats are longer, larger and faster than their prototypes, and will have improved sea-keeping powers. They carry also a heavier armament. Of the older boats the *Porcupine* has recently been passed on to the "A" Reserve, as ready for sea; the *Ranger*, built by Hawthorn, Leslie & Co., made a mean speed on her three hours' trial of 27·172 knots; the *Haughty* also made a speed of just under 28 knots on the Mapling, with an I.H.P. of 4,224. The names of the first batch of destroyers of 30 knot destroyers, and their distribution to the contractors is, the *Desperate*, *Larne*, *Foam* and *Mallard*, at Thornycrofts; the *Electra*, *Brazen*, *Recruit* and *Vulture*, at Clydebank; and the *Quail*, *Thrasher*, and *Virago*, at Birkenhead. The *Desperate*, on her official three hours' trial, made 30 knots with ease, the actual distance covered during the three hours' run being 103¾ statute miles, and this, although the wind was high and the sea rough for trial purposes. Messrs. Earles, of Hull, and The Naval Construction and Armaments Co., of Barrow, have each received orders from the Admiralty for the construction of two 30-knot destroyers. In the latter case these are additional to two already in hand.

The Engineer Students at Keyham.

Previous to leaving for the Easter vacation, the students at the Royal Naval Engineers' College, Keyham, were assembled in the gymnasium for the distribution of the prizes won at the last examination. Rear-Admiral Church, who was accompanied by Commander Grenfell, the Captain of the College, gave away the prizes after an inspection, followed by a short address. These prizes were, as usual, of a scientific and useful character, and the names of the successful students are as follows:—Prizes for study, Fourth year, Wilding, for general progress and the best papers in higher mathematical and mechanical subjects, physics and chemistry; Third year, Parry, for general progress and the best papers in physics and chemistry; Second year, Mitchell, for general progress and the best papers on physics and chemistry. English and French:—Martin for best paper in mathematics, Hamilton for general progress, and Wilshen for general progress. Prizes for workmanship: Carter, Dawson, Dowling, Rowe, Nicholson, Coleman, Hocken, Warren, Broke and Alexander. Prizes for professional subjects: Simmons, Dawson, Edmonds and Gillingham. The prize-giving was attended by, amongst others, Mr. R. Mayston, chief engineer of the factory at Keyham, Mr. J. Crocher, who has been acting as headmaster during the absence of Professor Worthington; Mr. Bennet, R.N., who is in charge of the practical educational course; with Messrs. Wharten, Cole, Davies and Carter, masters of the college.

Sheerness Dockyard.

The *Charybdis*, which has been refitting during Easter, has since left to rejoin the Particular Service Squadron. She had her new steam capstan fitted at Chatham. The torpedo-boat destroyers *Contest* and *Janus*, having been completed, have again taken their places in the instructional flotilla, but it is supposed that their places will presently be taken by the *Porcupine* and *Haughty*, so as to give all the completed boats a certain amount of work. The *Wye*, after refit, has left for the west coast of Africa and Ascension, carrying out a new crew to the *Magpie* gunboat, now about to hoist the pennant for a third commission. An extension of date has been made for the completion of the *Pelorus*, and it is not unlikely that day and night shifts will be needed to have her finished by the end of May, so that she may go into the "A" division of the Fleet Reserve by the middle of June. Another vessel in which there has been some delay is the *Cleopatra*, but the work of rigging her new spars will soon be completed now, and in any case she should be ready to join the Training Squadron if required before the vessels make their next cruise. She has had a very extensive refit, which is the reason why she has taken rather longer than was at first anticipated. The *Caroline* has come to hand for good, her active service being at an end on her paying off on April 10th. There is a report afloat that she will be used as a depot ship, and at one time it was suggested that she might be chosen as the new training tender to the *Britannia*. Now, however, it appears likely that she will join the list of vessels for sale. The gunboats *Onyx* and *Niger* will not both undergo refit at this yard, the former only being taken on hand while the latter goes to Portsmouth. In the engineer's department good progress is being made with the torpedo-tubes for the *Powerful* and *Terrible*, which are to be fitted at Portsmouth with these adjuncts. The repairs of the surveying sloop *Egeria* are being now carried out in the steam basin, where she will be masted and otherwise prepared for another commission. One of the chief questions submitted to the First Lord of the Admiralty during his recent visit was a proposal to fit out the old *Castor* as an overflow ship for the gunnery school, but it is not known what his decision is on the subject. Their lordships also had a look at the *Buster*, the new tug purchased for the service of this yard. They were also shown the new works in the Naval Recreation Ground, where great progress has been made with the construction of the ranges and drill battery. Nothing is yet settled about a rifle range, which is much wanted.

Two New Naval Works.

The second volume of the Royal Naval Handbooks is entitled "The Mechanism of Men-of-War," and is from the accomplished pen of Fleet Engineer Reginald Oldknow, R.N. This work is deserving of the highest praise, for a very technical subject has been treated in a manner which makes it essentially a book for the man in the street. Those who wish to learn anything at all about the development of steam machinery in the Navy will do well to consult this volume, and those who wish to make themselves thoroughly acquainted with the present methods of supplying our ships with engines and boilers, the manufacture and trials of these articles, and much more of the same nature, will find it here intelligently discussed and described in language which all can understand. The work is profusely illustrated, indeed, we suspect no book on the subject has ever before been provided with such a wealth of illustration, and this feature alone should make Mr. Oldknow's work popular. It is just the kind of book to put into the hands of a boy with a taste for mechanics. Like the previous issue of the Royal Navy Handbooks, the "Mechanism of Machinery" is of a handy size, excellently printed and most creditably turned out. The next volume promised is on "Torpedoes and Torpedo Craft," by Lieutenant George Armstrong, and will contain a great deal of information about Whitehead's Brennan's and the like, which have never before been published, as well as a chapter on torpedo warfare in China, by an English naval officer who was present. Another very handy publication recently issued is "The Naval Pocket Book," edited by Mr. Laird Clowes. It contains a list of the fleets of all nations, with the dates of construction of the different vessels, their speed, dimensions, coal capacity, and other information. As a first issue, this work is a credit to its compiler, who will no doubt in future editions correct such mistakes as have almost unavoidably occurred, although there are very few under the circumstances. Perfect accuracy in works of this kind must be almost unattainable. A system of classification of ships devised by the compiler, is more ingenious than valuable, but a very full index makes reference easy, while the plans of ships, various tables, and a calendar of events are all useful features. The Navy Handbooks are published by Messrs. Geo. Bell & Sons, and the Naval Pocket Book by the Tower Publishing Co.

Pembroke Dockyard.

In order to have the *Andromeda* afloat by January next, which is the programme, it is realized here that additional efforts must be made. It is hoped that the Admiralty will see their way to allowing "exertion money" to be paid, but there are also rumours as to taking on more hands and also working. "Overtime" in the principal machine room, day and night work is already in progress. The *Hannibal* makes good progress, but it will be some time yet before she is ready to have her electrical gear fitted on board, and it has been suggested that the men who are in the habit of doing this work might be sent to some other yard for a time in order to get an insight into such improvements as have been effected in recent years. The new tug here is to have her name changed from *Flying Vulture* to *Crocodile*. The new moorings for the port guardship are to be laid down off the west front of Pater battery instead of near Wear Point, as at one time was anticipated. The visit of Sir Frederick Richards and Sir John Fisher to this yard was not quite expected, but it is hoped that some good to the place will follow their inspection. The purpose of their journey down here was primarily to see if the *Hannibal* could be docked and fitted out at Old Milford, but the report of the engineers is to the effect that the entrance to the dry dock of the Milford Dock Co. is not wide enough to admit her, and therefore the project must be abandoned. Their lordships also inspected the ships in the yard and the berth where it is proposed to moor the battleship to fit her out. Two schemes have been prepared dealing with proposals for enlarging this yard, and these were also submitted to their lordships. One is a plan for the extension of the dry dock by absorbing the roadway and the adjacent slip, which would give a dock of 600 ft. in length and broad enough to take in any existing battleship. The other scheme is for the enclosure of a piece of land between an extension of Hobb's pier and the yard, which would give space for a basin to accommodate eight first-class ships and a dock extensive enough for all modern requirements. The launch of the *Hannibal* took place on April 28th and was most successful. It is stated that the *Andromeda* will be docked and fitted out at Old Milford. A floating dock is to be sent here from Devonport.

The Float-out of the "Mars."

The battleship *Mars* was successfully floated out of dock at Messrs. Laird Brothers' yard, at Birkenhead, on Monday, March 30th. The ceremony of naming the ship was performed by Mr. William Laird in the presence of a large crowd of spectators. The *Mars* is a sister to the *Majestic* and *Magnificent*, and will be pushed on to completion this year. She is in an advanced stage owing to the circumstance of her being built in a dock. When floated out she carried with her all her citadel armour and most of her barbette armour. It has indeed been stated that had it not been for a press of work delaying the delivery of the armour-plates from Sheffield, this part of the vessel's construction would have been completed by the date of the float out. The boilers of the ship were also on board with mountings and connections complete ready for steam, and the engines also in a very forward condition, so that it is probable that it will not be long before her trials commence. The main propelling machinery consists of two sets of engines of the triple-expansion inverted type, of Messrs. Laird's design. The boilers are eight in number, single-ended, and of the cylindrical return-tube type. Each pair of boilers is in a separate watertight compartment. The order for the construction of the *Mars* was given to the Birkenhead firm on March 26th, and her keel-plate laid June 2, 1894, just 22 months to date of floating out. She is to be ready for the pennant in September or October next. The *Mars* has been coated with Hartmann's Rahtjen's composition. In addition to this vessel her sister ships *Majestic*, *Magnificent*, *Illustrious*, *Jupiter*, and *Hannibal*, have also received this composition, as also half of the bottom of the *Victorious* and *Prince George*.

The Supply of Engineer Officers.

It is announced that in the coming July, forty additional students will be invited to join the Royal Naval Engineering College at Keyham, to which great additions are to be made under the provisions of the Naval Works Bill. As the number of students leaving the college at the same time is only thirty-eight, extra accommodation is very much needed and arrangements have been made for acquiring another private house in the vicinity of the college. The work of extending the building is, however, making good progress, and by July it is expected that the new wing will be ready for occupation, when some of the houses now used for the extra cadets will be given up. The grounds now used for recreation purposes having been included in the Keyham extension works, a new recreation ground is being provided, and a new boathouse for the use of the students.

DONOVAN'S PATENT IMPROVED STERN TUBE.

THE year 1895 was exceptionally prolific in the matter of broken propeller shafts, and this circumstance must be our excuse for again calling attention to a very useful improvement in stern tubes, the invention of Mr. J. W. Donovan, consulting engineer, of 3, Norfolk Street, Sunderland. The illustration shows the tube as now being fitted, and, to the practical reader, its simplicity and usefulness will at once be apparent.

As is well known, it is the action of the sea-water on the unprotected part of the propeller shaft D which is the chief cause of trouble to engineers. By this simple improvement this portion of the shaft now runs free from sea-water, the gland C effectually preventing the water reaching the part referred to. By means of the longitudinal openings E and E' access is given to gland for packing same, while also facilitating the examination of shaft, and making accessible for cleansing and painting at any time. The life of the shaft is thus greatly prolonged, and a considerable saving is effected in the cost of periodical surveys.

The first vessel fitted has now been running some 16 months, with results so satisfactory that the owners have given an order to have their next new vessel similarly fitted.

The tube has also been fitted to a large steamer about four years old, to replace the ordinary stern tube, which had been broken through accident to the shaft. This is one of the many advantages claimed by the patentee, namely, that the tube can be fitted to any vessel without involving structural alterations.

Several orders are now in hand for the tube, and we cannot but think that shipowners and underwriters will benefit largely by the adoption and recommendation of such a valuable improvement in the method of fitting stern tubes. The tube, we may add, is approved by Lloyd's, and has been recently passed by them for a 7,000 ton vessel.

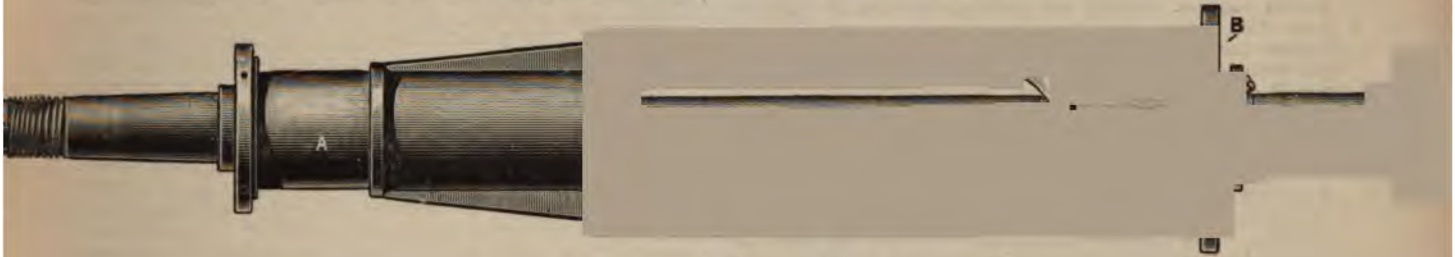


FIG. 1

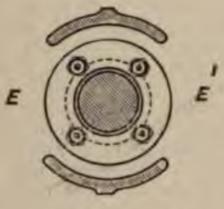


FIG. 2

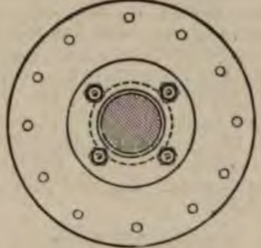


FIG. 3

THE FLEETS OF THE MAIL LINES.

(*From our own Correspondent.*)

Several Steamship Companies' Meetings

Have been held during the month. The most satisfactory has, perhaps, been that of the Union Line, which is beginning to reap the reward of the far-sighted policy of its directors in giving the public vessels somewhat in advance of what the trade was quite entitled to. The Cape is advancing in prosperity and in white population by leaps and bounds. The percentage of travellers amongst the colonists of South Africa is far larger than it is amongst our home dwellers, and thus the directors of the Union Company, whose policy I have always held up as a very wise one, are being abundantly justified for the anxieties and struggles of the past.

The Cunard meeting was harmonious, if somewhat sad, but there was not at all a satisfactory report to be listened to, and even without reckoning a dividend which was neither earned nor paid, the year leaves the line poorer than it found it. The mail boats to America have been full, and that at best prices. What can be the explanation of the position? The *Lucania* and *Campania*, are of course, expensive ships to run. But if they are, they are also big earners. It cannot be they which are responsible for absence of the dividend, and for the call on the reserves. It is the old crocks which cannot compete with the vessels they meet in every trade they touch. Hints were given of a new policy of opening up fresh channels of trade, and that with vessels of more suitable class. It was also said that when prices were encouraging the old coal-eaters and repair-bill-mongers should be disposed of. But it is no good waiting for such an opportunity. "Whilst the grass is growing the steed is starving," is an excellent proverb, which may here be paraphrased. "Whilst the market is waiting for improvement the old ship is quickly and incessantly depreciating." It is always hard to cut a loss, but the wise man does it. And, indeed, there are many vessels in the fleet which should owe the line nothing, for they must have been written down to nothing long ago.

The National Line has practically been absorbed by Messrs. Williams, Torrey & Feild, of the Atlantic Transport Line. My readers will remember that these gentlemen bought the share capital at a price considerably higher than others could see their way to offer. They indeed seemed at the last meeting to have thought they had paid a high price for the good-will of the business, which with the New York wharf made the most valuable asset. They have not been long in getting rid of the old boats Four of them are already disposed of. The price of two has not yet, so far as I have seen, transpired. But that of the other two was a trifle over a pound a ton, which is the value I put on them when I previously discussed the National Line's affairs. This may in some sort show Cunard's the value of their older craft in the Mediterranean fleet. It may be noted too that the alterations made in the National Line's articles of association have deprived Liverpool of another once famous mail line. What remains of the company now belongs to the port of London. The Liverpool office is to be closed and the work transferred to London, whence for some years all the ships have traded.

Shipping News from Southampton

is always amusing and generally inaccurate. I used to think that the extraordinary statements which appeared in the local press were designed to boom their port, and I admired and respected their ingenuity and boldness even if I could not admire their moral principles. Now, however, a closer study of the port and its press makes it evident that it was no bold scheme of "lying up the port" that prompted these extraordinary paragraphs, but merely sheer unadulterated ignorance. Thus we read that the *Pavonia* left Southampton at the end of March, after completing her season of trooping. "That she proceeded for London, and will now be replaced on the British India service." There are at least three misstatements in this simple announcement. The *Pavonia* did not sail for London, but for Liverpool. She will not be replaced on the British India service because she never was on it, and is not going on it now. Unknown apparently to themselves, the Southampton people have had a Cunard cargo boat in their docks. She has gone back to her home port and to her old work. The writer has either been afraid to mention the name of the dreaded rival or—and this is much more likely—he muddled the *Pavonia* up with the B.I.S.N. Company's, s.s. *Dilwara.*

A Sailor's Heroism.

I have already in these columns told the story of the loss of the s.s. *Aidar*, and of the captain's marvellous rescue after he had refused to leave his sinking ship because he would rather face what appeared to be certain death, than leave a wounded fireman. His bravery attained its very difficult object, for he was able to save the man's life, and now those who sit at home at ease are having their opportunity of expressing their admiration for his conduct. Medals and votes are pouring in thick and fast. The former including the Albert medal, which is the highest distinction a civilian can attain. We have all through the medium of the "largest circulation" become alive to the powers of the shilling subscription, and it has remained for the Liverpool *Journal of Commerce* to adapt the idea to the present case. Captain Nutman is a native of Liverpool, and it was fitting that the leading shipping paper in the town he hailed from should take up the matter of giving him some recognition. A pecuniary one was perhaps all it could give when honorary distinctions have been so liberally and deservedly showered upon him. The pecuniary recognition too, will assuredly not come amiss to a man who saw his floating home with all his kit and instruments go to the bottom of the Mediterranean. I wish the fund therefore every success, and I am sure my readers will aid it in so far as they can. For there is no real rivalry in serious matters between the bridge and the engine-room, whilst in the present case there is the important fact to be remembered that the member of his crew whom Captain Nutman saved was, in fact, a member of the engineer's staff. Like deserves like, and probably we shall not have to wait long to have a recurrence of one of those acts of bravery in the engine-room, where an engineer shuts off steam after an accident, or stays at his post at the risk of his life in case of leakage—to see that the race for the palm is an even one where British seamen and British engineers are concerned. England still finds that every man afloat does his duty.

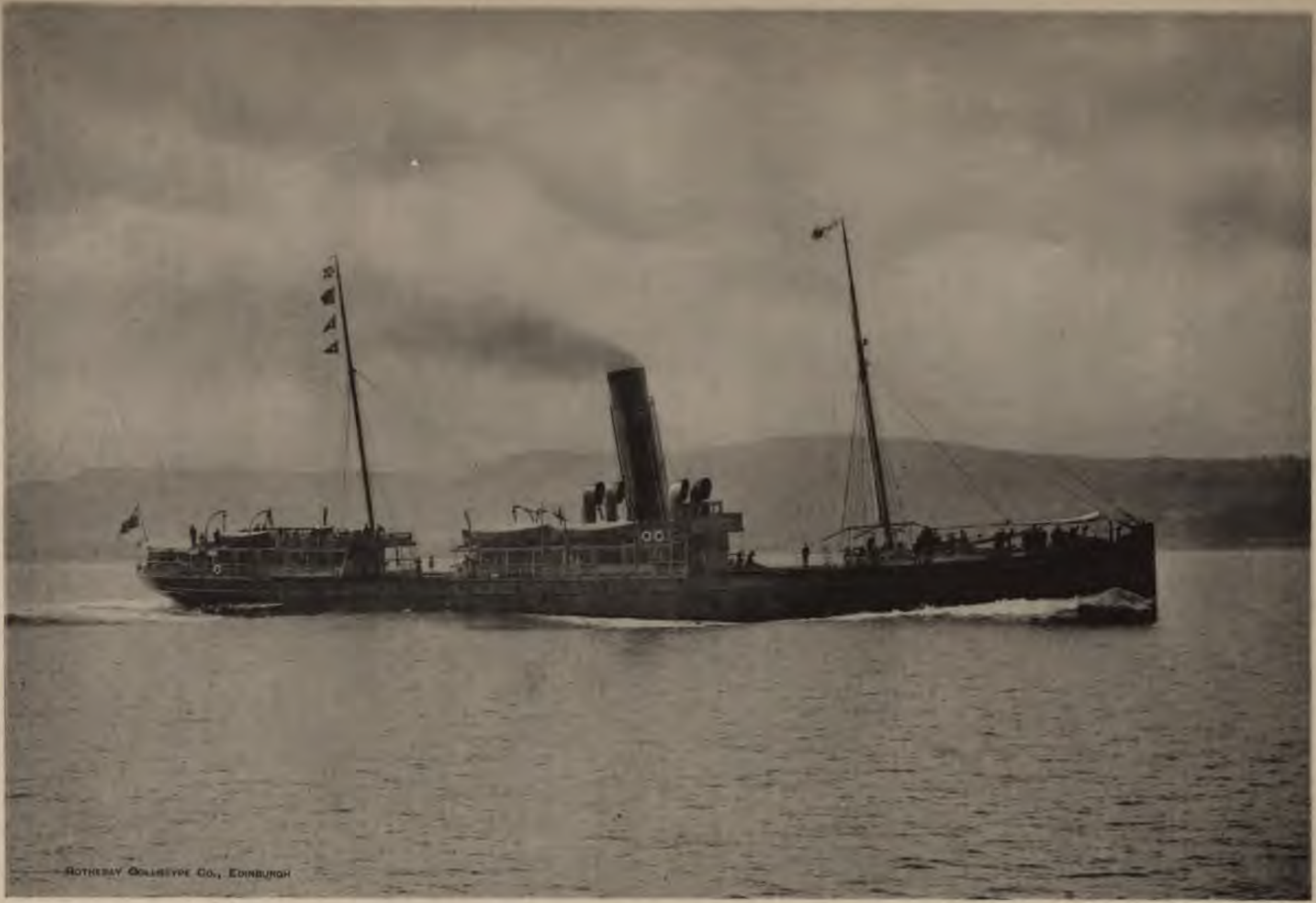
Captains.

There have been some recent changes in the commands of the New York mail boats, and in other vessels directly connected therewith. The chief officer of the *Campania* has got a command through the unfortunate accident to the *Cephalonia* at Holyhead. This accident, by the automatic rule which holds in no other profession—deprives a respected officer of the position to which he has attained after many years of faithful service. It is true it gives another the post. But the rule still tends largely towards discouragement. This little incident, by the way, what with floating and making good, is admitted to have cost the shipowners no less than sixteen thousand pounds. Then Captain Grant of the New York has left the American Line service, and has taken employment as a yacht captain with an American multi-millionaire. By this means he will attain an increase in salary combined with probably longer periods on shore than are the lot of many mail skippers—certainly far longer than are the lot of those who drive American liners on the "three weekly round." His departure has led to a sort of general post amongst the other captains of the American mail boats. Captain Jamieson, it is true, keeps the *S. Paul*, but Captain Riddle is off with his charge, the *S. Louis*, now at Philadelphia having her funnels replaced by larger ones, and Captain Watkins has the *New York*, whilst the *Paris* is now under Captain Paslow. This gentleman had one of the older Inman liners in former days, and from her was promoted to the command of one of the new twin-screw Red Star boats. The poor old *Helvetia*, which, as readers will remember, foundered in the Bay of Biscay, when going to Marseilles to be broken up, has been the subject of some considerable litigation in the French courts. The underwriters, with whom insurances were made upon her for the voyage round, alleged that they were justified in refusing to pay the claims made on the policies. They based their refusals on the grounds that certain facts relating to the condition of the vessel should have been disclosed to them, and that these were in fact suppressed. They also contended that on her last trip the vessel had ceased to be seaworthy. The French court accepted their view of the case, and as corroboration, looked in an unofficial sort of way at the findings of the British Court of Inquiry held under the auspices of the Board of Trade. The result of this litigation, if it be not upset on appeal, will be to prevent the French buyer from recovering his insurance money.

I have received from the American Line a little pamphlet containing something over a score of excellent illustrations which will be of interest to all my readers. There are pictures of the outward appearance of the six twin-screw boats they possess in their kindred fleets of the American and Red Star Lines. These, of course, include three pairs of sisters. The *New York* and *Paris* famous as record breakers and as the first mail boats built with twin screws for the Atlantic trade. The *Southwark* and *Kensington*, high class vessels of the modern, if less ambitious type, and the *S. Paul* and *S. Louis*, rightly the pride of the American Republic. A large number of illustrations of the interiors of the two first pairs are given. We most of us have seen the arrangements of the older boats illustrated to a considerable extent. But the views of the saloon accommodation of the Philadelphia-built boats will be interesting to all. So, too, will be the information as to steerage accommodation. For when all is said and done about the wonderful things provided for your saloon passenger and the increase of luxury there, we cannot forget that the saloon passenger existed ever since there were mail boats, steam or sail. And he always had the best thing going at the time. It certainly was never so good before as it is now, but still it has been a gradual expansion and he has moved forward not much more decidedly than has the guest at the hotel. Look at the great and palatial building just in course of being opened off the Strand. Here for ordinary hotel prices one can get the use of the most luxurious public rooms conceivable. They do not for a small high bedroom have to pay more than they would pay for a like room elsewhere and they have the advantage of these wonderful public rooms. So it is on board ship. The accommodation of your Atlantic flyer is not a greater increase on the accommodation of the steamer of 40 years ago than is the luxury of the hotel Cecil upon the miserable class of sanded floor pot-houses which even now exist in the older parts of London or upon the flyblown and tawdry coffee-rooms of the old fashioned hotels. But the steerage passenger has been created by the modern mail steamer. It was the Inman Line that first allowed him to travel by a steamer at all. The sailing vessel was previously all he could hope for. Now the ingenuity of modern shipowners and their employees has shown how cleanliness, decency, and comfort, can be combined with low fares and large numbers carried. The illustrations of the steerage arrangements of these boats will therefore be of interest. The list of the combined fleets—all owned by the International Navigation Company—is a large and formidable one. It however, contains some vessels, such as the *Chester*, which are not likely long to remain in the fleet.

Southampton and the Troops for the Cape.

On Saturday, April 25th, I went down to Southampton as the guest of the Union Line Company's directors to see the first detachment of troops start for South Africa. The occasion was most interesting for that and for other reasons. In the first place it is some eight months since I have been there, and in eight months the present directions do a great deal towards the improvement and development of the facilities of the port. I went down by the Union Line special, a vast train, drawn by two locomotives, and one that would not be unworthy of an Atlantic record breaker's special in the height of the passenger season. The platform at Waterloo was a sight with the crowds of travellers and their friends. All sorts and conditions of men and women were mixed together to an extent unusual even where travelling is concerned. There was much to interest the spectator, and it would not be difficult to draw a moral from what one saw. Bound to the Cape at the present moment are always a large number of persons who are bent on making their way in life, as well as many who have found wealth by successful speculation, and who think that, having attained it, they have acquired the freehold of the earth. Besides these there were a theatrical and a music hall company bound for Johannesburg, and they naturally had large troops of friends to see them off. The journey to them meant simply a well-paid holiday of a definite period, with a gratuitous opportunity of seeing one of



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the places where history is being made. They were light-hearted enough, and small blame to them for it. But in strong contrast to these were the officers going out with the troops. In these days of examinations and scientific warfare, the soldier who means to get on in life is one who has to take things in earnest and appreciate his responsibilities. Our fellow-travellers had many last instructions on important matters to discuss, for they had no idea a week previously that they were not permanently stationed in garrison at home. A week is a very brief space to settle up private affairs and to get a campaigning kit together. The departure for active service, though suggestive of distinction and promotion, must always have a more serious side to it.

Punctually at 11.40 the special drew out of Waterloo, but its progress was not very rapid. We ran down to the docks without a stop, save to change engines at the Docks Station. Going slowly down through the dock estate, past the new warehouses, one had time to look about. In the inner dock were lying the old Royal mail boat *Thames*, and the *Berlin* of the American Line, apparently quite recovered from the late collision. Then round the back of the American Line shed, now deserted, as the mail boat was already outside the Needles. Then over the Caisson to the new graving dock to a shed, built where twelve months ago the Solent disputed with the mudbanks for possession. There lay the Union Company's mail boat *Moor*, for which we were bound, and a few steps led us to her gangway. This was at 2 o'clock, and before Captain Griffin would show me round he insisted upon lunch—where many other visitors were enjoying the hospitality of the Union Company. The *Moor*, as readers will remember, was built by Messrs J. & G. Thomson, and by them recently lengthened and improved. She is now one of the finest boats trading to the Cape. The first thing noticeable about her is the height of her 'tween decks, a thing to be appreciated in the tropics, as is the excellent ventilation which has been introduced in all classes of passenger accommodation. The saloon passengers have luxurious quarters. The saloon opens direct into the staircase in the German style. There is a good band, also a German feature, which plays during meals in the main companion. The decoration of the saloon is inlaid wood, and part at least of it has been in the vessel from the first. It is as good as anything put on shipboard now-a-days. When we had done in the saloon, Captain Griffin took us through the second and third class accommodation. The latter is surprisingly good. The preparations for carrying the troops had been thoroughly made, although the time for making them had been so limited. The only point by which one could discern that the original design of the *Moor* has been altered, was the long waist between the bridge and the forecastle. The captain's accommodation and the appliances at his hand are very complete. He has switches which command the electric light in the navigating lanterns and other important places at his hand, and voice tubes to the principal officers on duty by his bed. The vessel is now steered with Brown's telemotor. Just when this inspection was going on we were aroused by the cry, "Here she comes," and out of the entrance of the Empress Dock came the tug *Vulcan*, towing the *Warwick Castle*, which was also bound for the same destination. She had 700 or 800 troops on board, and they crowded the decks as they passed close alongside. The red-coats were mingled with a few yellow ones, showing that some of the men had already got into their campaigning kits. The crowds on the *Moor* and on the dock wall cheered and waved hats and handkerchiefs, whilst the soldiers answered with "Auld Lang Syne," which was played by the band also. As the Castle boat dropped away to Calshot, and the old American liner *Chester*, we were shown that it was time to go ashore if one did not wish to visit Madeira, and a few minutes later the *Moor* followed on the heels of the Castle boat. There was a scene of equal excitement, and then a rush for the special train which ran up to Vauxhall direct with the company's officials and guests. The ease of travelling was demonstrated in our case, but we had seen that in spite of the luxury of the civilian, the soldier is still able and ready to do anything, and go anywhere. His brother afloat—whether in Queen's or private service—is ready too.

Messrs. The Harrison Engine Co., Limited, announce that they have taken over the business of The Harrison Patent Steering Engine Co., Limited, and appointed Mr. R. W. White managing director.

The Mechanical Handling of Goods at Riverside Premises.—At the ordinary meeting of the Civil and Mechanical Engineers' Society, held on Thursday, March 12th, a paper was read by Mr. H. Coward, C.E., on "The Mechanical Handling of Goods at Riverside Premises." The paper describes various old-fashioned means of raising, lowering, and conveying goods from and into ships, barges, and warehouses, and traced the gradual improvement that has taken place in the mechanical means of handling goods up to the present time. The author pointed out some of the troubles met with by those who have to deal with the apparatus that is used, and concluded by describing the Temperley Transporter, an ingenious apparatus that is now being very largely used although but recently introduced to the notice of shippers and wharfingers. Some excellent models were on view. A discussion of an interesting character took place at the conclusion of the paper, among those who took part therein being S. Court, C. T. Walrond, E. H. G. Brewster, W. R. Hay, J. N. Cooper, W. C. Penn, and P. A. Creeke.

Institution of Naval Architects.—The summer meetings of the Institution of Naval Architects will be held this year in Hamburg on Monday and Tuesday, June 8th and 9th. On Wednesday, June 10th, the meetings will be transferred to Berlin, on the invitation of the Imperial German Government, and they will be continued there during the remainder of the week. The Hamburg American Co. have offered to take the members over in a body from Tilbury to Hamburg in their twin-screw Transatlantic liner, the *Furst Bismarck*, free of charge. The steamer will start either late on Saturday night, June 6th, or else early on Sunday morning, June 7th, and will arrive in Hamburg in about 20 hours after its departure. A special train, of which particulars will be given in the detailed programme, will convey the members from London to the port of embarcation on the Saturday evening. Full particulars of the papers to be read, of the works and places of interest to be visited, and of the excursions and entertainments which are being organised, will be forwarded to the members on or about May 23rd. The meetings are receiving the warmest support from the Imperial Government, under whose direction the arrangements in Berlin are being prepared

The Argentine Government have, in the course of construction at Messrs. Yarrow's works, Poplar, four torpedo-boat destroyers. These are 190 ft. in length by 20 ft. beam. They are partly armour-plated and have a guaranteed speed of 26 knots. In addition to these vessels, Messrs. Yarrow & Co. have on the stocks six first-class torpedo boats for the Chilian Navy. These are 150 ft. in length and will have a speed of 25½ knots. These last vessels are similar to the torpedo boat *Viper*, recently built by the same firm for the Austrian Government.

The New Torpedo Destroyers.—Messrs. William Doxford & Sons, have been commissioned by the Admiralty to build two of the 30-knot torpedo destroyers, in this year's naval programme. This is no more than was confidently expected in Sunderland, remembering the highly satisfactory manner in which the two boats, *Haughty* and *Hardy* (already built by this firm) have so far acquitted themselves.

Re-Starting of a Sunderland Shipyard.—The yard of Messrs. Osborne, Graham & Co., North Hylton, Sunderland, which has been practically inoperative for some time, is about to be restarted; the firm having obtained an order to build on Norwegian account a steamer of over 3,000 tons carrying capacity. The engines, it is understood, will be supplied by Messrs. George Clark, Limited, of the Southwick Engine Works.

Fothergill Prize.—The Council of the Society of Arts, John Street, Adelphi, W.C., offer the Fothergill Prize of £25 and a silver medal, for a paper on "The Best Means of Effectually Preventing the Leakage of Current to Earth in Electrical Installations from Generating Heat and setting Buildings on Fire." The paper to consist of about eight thousand words, and to be sent to the secretary on or before 1st October, 1896.

Institute of Marine Engineers.—The sixth annual dinner of this institute is postponed to Wednesday, June 17th, in deference to the wishes of the president, when it will take place in the King's Hall of the Holborn Restaurant. The council and committee hope that there will be a large assembly on the date named. Tickets for the dinner, 8s. 6d. each.

THE STRENGTH OF CYLINDRICAL SHELLS.

SOME short time ago an account of some interesting experiments made by Mr. J. C. Spence was published in a contemporary with a view to prove that by treating the shells of short cylindrical boilers of the marine type as endless rings, a source of great resistance was being ignored. On account of the great interest of the subject and of the ingenious method adopted by Mr. Spence in carrying out the experiment we have pleasure in giving our readers the opportunity of judging for themselves from an account of the experiments, how far the conclusions drawn by Mr. Spence are in accordance with theoretical reasoning. There can be no doubt that the pressure on the shell of a boiler is to a great extent balanced by circumferential tension in the shell plate. The only question open to doubt is whether an appreciable part of it is transmitted to the ends. Now in any boiler made in the ordinary way the effects of these two sets of resistances are so mixed up together that it is impossible to separate them. One way out of the difficulty was to eliminate one of these factors and then find the value of the other. The factor to be eliminated was clearly the one about which there was no dispute—viz., circumferential tension.

In order to carry out the solution of the problem in a practical and conclusive manner, a model, designed by Mr. Spence, was built and tested by Messrs. John Penn & Sons, Limited, of Greenwich, through the kindness of Mr. J. P. Hall.

The results of these tests, which are given below, go far to form conclusive evidence that the factor of "end" resistance is not one that should be ignored. These experiments were devised merely as a preliminary test to ascertain whether this factor was of sufficient magnitude to be worth the trouble of any further and more careful experiment. As the model which had no strength as an "endless ring" stood a pressure of 270 lbs. to the inch without serious damage to the shell plate, and as the working pressure of the model would only have been about 100 lbs., according to present practice, if it had been fitted with a first-class riveted joint, the conclusion seems inevitable that in treating the shells of short boilers as endless rings, a resistance of considerable importance is being neglected. A resistance, which is, of itself, capable of balancing a pressure of 270 lb., is certainly not one to be ignored in designing a structure to stand 100 lbs.

By most authorities on the subject, it is assumed as self-evident that the pressure on the shell of a cylinder, and on every elementary part of the shell, is balanced by circumferential tension. If this assumption had been correct, the model would have had no strength.

Other authorities have calculated the pressure which the comparatively thin plates of boiler shells are capable of transmitting to their ends, and have come to the conclusion that this pressure is too small to be worth consideration. These calculations have all, so far as can be ascertained after diligent search, been based on the hypothesis that the pressure which a boiler shell is capable of transmitting to its ends is limited to the pressure which a longitudinal strip of the shell plate could transmit to its ends as a beam, supported at the ends and uniformly loaded. According to this view, the shell plate of this model would have been bulged outwards at the centre of its length by a very small pressure; a pressure of 2 lbs. to the inch being sufficient to strain the plate to its elastic limit, and 4 lbs. being about sufficient to rupture it.

On the other hand, if the distribution of stress in a cylinder agreed with the theory suggested by Mr. Spence (see "Transactions of the North-East Coast Institute of Engineers and Shipbuilders," vol. vii., pages 228 and 229), the pressure the model was capable of sustaining would be only limited by the resistance of the shell plate to shearing at its ends, and the stress would be greatest at the ends, and least at the middle of the shell. Taking the elastic limit of steel plate at 10 tons to the inch, the model should have stood a pressure of 280 lbs. before the plate reached this limit.

Now the discrepancy between these theories is so enormous that no great nicety of observation is necessary in ascertaining which of the two is the nearest approximation to the truth in any particular case. The issue to be tried by this experiment was whether the shell plate of the model would bulge outwards at the centre under a pressure of 2 lbs. to 3 lbs., or whether it would bulge outwards at the ends, and stand a pressure of 200 lbs. to 300 lbs. To decide this question, it was thought that no more delicate instruments were necessary than a pressure gauge and a 2-ft. rule.

The great thickness of the end plates of the model might, at first glance, be considered to detract from the value of these experiments, but the whole question turns upon the capability of the shell plate itself to transmit pressure to its ends. However strong these ends might be, they could not receive any more pressure than the shell plate was capable of transmitting. Their strength has no more to do with the strength of the shell plate than the strength of the shackles holding a chain in a testing machine has to do with the strength of the chain to be tested.

The small size of the model might also be thought to militate against the value of these experiments. But the strength of a cylinder depends solely on the relative proportions of its parts, and not on their absolute magnitude. Thus the strength of the shell of this model, whether it is treated as an endless ring, or as a beam supported at its ends and uniformly loaded, or as a collection of longitudinal strips, each acting as independent beams, or from any other point of view, is the same as the strength of any other cylinder made to the same scale. The shell of the model may be considered as equivalent to a boiler shell 10 ft. in diameter by 10 ft. long by ¾ in. thick, reduced to a scale of 1 in. = 1 ft.

Construction of Model.—The construction of the model is clearly shown in the adjoining diagram. The shell of the model was made of steel plate rolled in a cylinder 10 in. in diameter. Butt straps were riveted to one edge of the plate, the other edge being free to move in and out of this joint. As such a joint could not be made watertight, an india-rubber liner was fitted inside the steel shell. Two strong plates of cast iron 1½ in. thick were fitted and connected by a longitudinal stay 1½ in. in diameter. Into one of these end plates two couplings were fixed; one for a pressure gauge, the other for connecting the model to a test pump. Strong rings were provided to fasten the ends of the shell when required.

This form of longitudinal joint was designed to allow the unriveted edge to move freely in the direction of the tangent to the circle and at the same time to prevent its moving outwards in the direction of the radius of the circle. It may be thought that the strong T-iron used for this purpose was unnecessarily strong, but the model was first tried with the butt strap made of ⅛-in. plate, as shown in Fig. 4. As this joint bulged out at a pressure of only 160 lbs., when the rest of the plate showed no signs of strain, it was evident that the joint was much weaker than the continuous plate, and as the experiment was designed to ascertain the strength of the plate and not the weakness of the joint, the T-iron butt strap shown in Fig. 5 was substituted for the one first used, and even with this, the joint and the plate near to the joint were very much weaker than the rest of the shell. Had the plate of the T-iron butt strap been riveted to both edges of plate, it would have been strong enough to compensate for the breach of continuity in the plate, but it could not be so riveted without introducing the element of circumferential tension, which had to be avoided at all hazards. In the joint as first made, and even in the joint as finally made, it is evident that the pressure on the plate in the direction (*a*) was only resisted by the rivets at (*b*), and that a thin plate, or even a stout T-bar held by rivets at such a distance from the point where the pressure was applied, could not be nearly so rigid as the solid plate. An inspection of the model shows that the plate at the unriveted side of joint was palpably weaker than the rest of the shell. The measurements given in Table II. show this, but not so effectively as a sight of the model, which can be seen at Mr. Spence's office, 56, Bishopsgate Street Within, E.C.

The thick end plates were used as the simplest way of getting a sufficient surface for making the end joints. If a thin plate proportionate to the end plates of boilers had been used, it would have required additional stays, and would not have afforded the same facilities for fixing couplings as the thick plate.

The outer rings round the ends, being cut through at the longitudinal joint, had no strength except what they derived from the bolts. They were used merely as washers to distribute the strains evenly over the plate, so as to avoid local strains in the plate at the bolts. They were made flush with the end plate, so as to limit the shell plate both as regards pressure and resistance to the definite length of 10 in.

(*To be continued.*)

NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from March 25th, to April 23rd, 1896:—

Abbott, W. J., staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet.

Anderson, W. J., engineer, has been promoted to the rank of chief engineer in Her Majesty's fleet.

Anderson, William J., chief engineer to the *Skipjack*, to date March 7th.

Batchelor, Harry R., engineer to the *Magpie*, additional for recommision, to date April 17th.

Bennington, J. W., staff engineer to the *Hermione*, to date April 10th.

Bevan, W. J., staff engineer to the *Hood*, to date April 16th.

Blakeman, M., engineer, has been promoted to the rank of chief engineer in Her Majesty's fleet.

Blakeman, Mark, chief engineer to the *Daphne*, to date February 2nd.

Bolt, C. W., engineer to the *Rattler*, to date April 21st.

Brown, Thomas T., assistant engineer to the *Trafalgar*, additional for the *Nelson*, to date April 14th.

Bryan, Richard, engineer to the *Wildfire*, additional, for the *Sans Pareil*, to date April 17th.

Butcher, J. B., engineer to the *Terrible*, to date April 10th.

Charlton, F. J., assistant engineer to the *Powerful*, to date April 10th.

Chisman, Edward, engineer to the *Empress of India*, to date March 24th.

Daves, H. F., engineer to the *Nile*, to date April 10th.

Denny, John T. H., fleet engineer to the *Trafalgar*, additional, and for recommission to date March 24th.

De Paris, Victor, engineer to the *Victory*, additional, to date March 24th, and afterwards to the *Fox*, to date April 14th.

Duffell, W. J., engineer to the *Repulse*, to date May 5th.

Fincham, W. C., staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet.

Ford, Hugh L. M., assistant engineer to the *Trafalgar*, when recommissioned, undated.

Glyes, David J., fleet engineer to the *Dreadnought*, to date April 16th.

Gorfett, G. J., chief engineer, has been placed on the Retired List of his rank.

Ham, John W., engineer to the *Victory*, for the *Brazen*, to date April 15th.

Hardcastle, C. V., engineer to the *Grafton*, to date April 21st.

Hefford, Edward O., assistant engineer to the *Mersey*, to date April 21st.

Howell, Llewellyn, assistant engineer to the *Magnificent*, to date March 24th.

Hudson, George W., chief engineer to the *Victory*, for the *Iris*, to date April 16th.

Hughes, Henry R. S., assistant engineer to the *Trafalgar*, when recommissioned, undated.

Kimber, John L., assistant engineer to the *Victory*, additional, to date March 24th, and afterwards to the *Fox*, to date April 14th.

Liversidge, John G., engineer to the *Theseus*, additional, for the *Snapper*, to date April 21st.

Little, Herbert J., engineer to the *Trafalgar*, additional, for the *Nelson*, to date March 24th.

Meiklem, Robert A. R. (probationary), assistant engineer to the *Grafton*, to date April 21st.

Meiklem, Robert A. R. (probationary), assistant engineer to the *Pembroke*, to date April 11th.

Meiklejohn, Harry J., engineer to the *Pembroke*, supernumerary, to date April 21st.

M'Lean, H., chief engineer to the *Severn*, undated.

Moffatt, E. G. P., chief engineer, has been advanced to the rank of staff engineer in Her Majesty's fleet.

Moon, Henry J. J. G., fleet engineer to the *Thunderer*, to date March 24th.

Morrison, A., engineer, Royal Naval Reserve, to be senior engineer.

Moysey, William H. S., engineer to the *Vivid*, additional, for the *Ferret*, to date April 21st.

Murray, John A., chief engineer to the *Victory*, additional, for the *Iphigenia*, to date April 16th.

Noll, George W., engineer to the *Galatea*, additional for the *Sheldrake*, to date April 16th.

Norgate, R. S. G., chief engineer, has been advanced to the rank of staff engineer in Her Majesty's fleet.

Odam, Edward R., chief engineer to the *Fox*, to date April 14th.

Oliver, Arthur, assistant engineer to the *Resolution*, to date March 24th.

Parsons, G., staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet

Ramsay, George, chief engineer to the *Blanche*, to date May 5th.

Rattey, William, assistant engineer to the *Nelson*, to date April 14th.

Richards, Percy B., assistant engineer (temporary) to the *Royal Sovereign*, to date April 21st.

Robertson, Gordon, assistant engineer to the *Majestic*, to date March 24th.

Rule, T., staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet.

Sanders, J. S., staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet.

Short, Edward A., engineer to the *Victory*, additional, for the *Beagle*, when paid off, undated.

Smith, Edgar C., assistant engineer to the *Trafalgar*, when recommissioned, undated

Spriddle, W., assistant engineer (temporary) to the *Orlando*, to date April 10th.

Stevens, John G., chief engineer to the *Nelson*, to date April 14th.

Tucker, Elijah, fleet engineer to the *Colossus*, undated.

Tuckwell, H. M. S. (probationary), assistant engineer, has been confirmed as an assistant engineer in Her Majesty's fleet.

Turner, William F., chief engineer to the *Victory*, additional, for the *Mercury*, to date March 24th.

Vining, H. P., engineer, has been promoted to the rank of chief engineer in Her Majesty's fleet.

Vining, Henry Percival, chief engineer to the *Vernon*, for the *Seagull*, to date March 13th.

Walker, Henry J., staff engineer to the *Victory*, additional, for the *Boadicea*, to date March 24th.

Walker, J. J., staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet.

Whayman, William M., assistant engineer to the *Grafton*, to date April 21st.

Wheater, P., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

White, Arthur F., assistant engineer to the *Blanche*, to date May 5th.

Williams, Frederick C., engineer to the *Victory*, for the *Havock*, to date April 15th.

Worth, Frederick, staff engineer to the *Vulcan*, to date April 16th.

HOAR & BROWN'S HARDWOOD MARKET REPORT, APRIL 22nd, 1896.

TEAK.—	Timber. Loads.	Planks. Loads.	Blocks. Loads.	Total. Loads.
Stock, 1st April	8,316	2,893	81	11,290
Landings	—	26	—	26
	8,316	2,919	81	11,316
Deliveries	420	256	—	676
	7,896	2,663	81	10,640

Enquiries have been numerous lately, many of them resulting in business. A large quantity for Germany has been selected from landed stocks here, and will shortly be delivered. A floating cargo has also changed hands for the same country.

Prices remain firm at figures equivalent to those of last month.

It is still very difficult to obtain quotations for forward shipment from Burmah, and while this state of things continues there is good prospect for landed stocks going off at remunerative prices.

There is a considerable quantity of old stock still unsold, which is being offered at much lower rates than the ordinary fresh wood, but up to the present there have been few buyers for this class of timber.

PLANKS.—During the last month importations have not been so free, and shippers are holding more firmly at enhanced figures. The stock is fairly light and prices may gain a slight advance. Quotations for special specifications are ruling much higher.

MAHOGANY.—The demand for Tobasco has fallen off somewhat lately, and prices appear likely to recede unless business becomes more active. Stocks are fortunately not over-abundant. There has been little or no enquiry for Honduras wood, and the stock at present should be quite sufficient for requirements. Only one order for special long lengths is pending. Cuba is still holding its own at advanced figures, importations having been light, but there are two cargoes expected to arrive shortly. Only a limited quantity remains in first hands, and none of any character. Cargo buying has been active, especially for speculative account.

Paraguay and Panama are sending some considerable consignments. The early arrival of the first-named wood realized a good figure, but since then some cargoes are offering at 10 per cent. lower. The Panama showed a good result at sale, but cannot be expected to maintain its position considering the poor class of shipments now received. African of good quality finds ready buyers at exceptionally high figures, but for strong and inferior wood, values have not risen much. Minimum Honduras and Tobasco has mostly been cleared out up to 4½d., but the shipments lately from other ports have put a stop to further dealings in any quantity.

CEDAR.—For the present the market is supplied with sufficient Paraguay to last some months, especially if cargoes now afloat are destined here. The demand for box-wood is small, and boat-builders' requirements are not placed on the market now on account of prices being prohibitive.

WALNUT LOGS.—There has been considerable activity in this wood, and values rose to an absurd figure, which caused shippers to immediately flood the market, consequently prices are now lowered to a more sensible basis.

KAWRIE PINE.—A fair demand still exists at the old rates, but a large cargo due to arrive very soon will probably cause some weakness on the part of holders, and lower quotations will be the temporary result.

SEQUOIA.—The stock is greatly reduced, and other woods having rapidly risen in value, there has been an opportunity to clear off large parcels at a slightly advanced figure. At the present rate of consumption London will soon be cleared of this wood.

WHITEWOOD.—The price planks and boards are now realizing prevents dealers holding large stocks, and only a hand-to-mouth trade is carried on. Logs are not doing so well and some cheap parcels are now offered.

GREENHEART.—Enquiries are about for small wood, but there is none in first hands. Prices are ruling fairly high though the demand generally is slow, and stocks are light.

Taking into consideration the holidays, the amount of turnover may be described as fairly good, but trade does not possess the tone that existed a few months since.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(From our own Correspondent.)

THE Admiralty have given out the orders for the 20 torpedo-boat destroyers to be built under the Naval Programme for the current year, five of which will be built in Scotland, three we understand to be constructed by the Fairfield Co., Govan, and two have been offered to Messrs. James and George Thomson, Limited, Clydebank. The new boats will be constructed with due regard to the minimum of power for the speed as well as the lowest coal consumption possible. If the coal consumption exceeds 2½ lbs. per I.H.P. per hour, the weight carried on board at the official speed will be augmented to the extent of two tons for each 10th of a lb. of coal consumed in excess of the 2½ lbs. per unit of power. Again, if the power exceeds a given limit a similarly graded addition to weight will be made. The effect of these additions to weight in so small high-speed vessels is exemplified by the difference in speed obtained with the *Desperate* on her preliminary and official trials. On the former, when she carried only 15 tons, the speed was 31·035 knots, while with the official load of 35 tons, the speed for practically the same power was 30·1 knots—a considerable difference at such a high rate. In the boats of 27 knots speed the weight carried was 30 tons, and there was no limit to the coal consumption, so that in some cases it ran up to 3½ lbs. per H.P. per hour.

The Clyde Shipping Co., Limited, have contracted with the Caledon Shipbuilding and Engineering Co., Limited, of Dundee, for a high-class passenger and cargo steamer of about 1,300 tons. The vessel will be similar to the *Fastnet* and *Lizard*, the two latest additions to the Clyde Shipping Co.'s fleet.

Messrs. Fleming & Ferguson, Limited, shipbuilders and engineers, Paisley, have received an order from the Queensland Government to build a powerful pump and bucket hopper dredger, and have also contracted with the Cork Harbour Commissioners to build a self-propelling side-ladder bucket dredger.

Messrs. Lobnitz & Co., Renfrew, are reported to have received an order from the United Steamship Co., of Copenhagen, for two steel screw steamers of 2,000 tons deadweight each.

Messrs. Murdoch & Murray, shipbuilders, Port-Glasgow, have received an order for a steel twin-screw steamer. This steamer will be similar in dimensions and design to several already built by this firm for the same owners, and is intended for passenger and cargo service on the river Amazon. The machinery will be of the compound surface-condensing type, two sets of which will be supplied by a firm in the upper reaches of the Clyde.

Messrs. Scott & Co., Greenock, have recently contracted for three twin-screw steamers for a company at Rio de Janeiro, which will each be 170 ft. in length, 35 ft. in breadth, 9½ ft. in depth, and carry 500 tons deadweight. The builders will supply engines capable of developing 400 I.H.P.

The Dundee Shipbuilding Co. have booked an order to construct a steel floating graving dock for a foreign government. The dock is to be 160 ft. long, 45 ft. broad, and will be fitted with sluices, &c. When completed the dock will be taken down and transhipped.

Messrs. J. G. Rowan & Co., Greenock, have secured the order from Messrs. Caird & Co., shipbuilders, for the entire upholstery furnishings for the new P. and O. steamer *India*, and also for the other two P. and O. steamers recently contracted for.

The Steel Co. of Scotland and the Glasgow Iron and Steel Co. secured orders from the Admiralty for a quantity of boiler plates. The Glasgow Iron and Steel Co. are busy with steel material for torpedo boats which are being built in the south for foreign governments.

TRADE NOTES FROM THE TYNE, WEAR, TEES, HARTLEPOOLS, &c.

(From our own Correspondent.)

THE TYNE.

Shipbuilding.—Since last month enquiries for new tonnage appear to have fallen off somewhat, a result which may be attributed to the advances in wages, which have necessitated a corresponding rise in shipbuilers' quotations. That the claims for advances were made prematurely is shown by the fact that two large yards are lying absolutely derelict on the Tyne, while two or three others are insufficiently supplied with work. The circumstance is further emphasized by the fact that the lower reaches of the river are still largely blocked with groups of steamers for which there is no work, and by the still more significant fact that a great number of men continue to be out of employment. In other districts the state of affairs is even worse, for the large amount of Government work that has been placed on the Tyne has helped to counterbalance the lack of mercantile orders. The shipbuilders must have known that, in presence of a demand which was largely speculative, an advance in price would be certain to check business; but they could scarcely be said to be free agents, and were doubtless forced by the exigencies of the situation to act against their better judgment by giving advances of wages before the demand for tonnage was sufficiently strong to render such action advisable. If wages could have been advanced without advancing prices, all might have been well; but it is needless to point out that such a course was impossible, the margin of profit having already been brought to the finest point imaginable.

The question is now done with for a time, and if there is any real life in trade, the check to business caused by the increased cost of production will perhaps not be of long duration. In view, however, of the fact that there is such a thing as foreign competition, and that it is increasing year by year; it is more than ever to be desired that those having charge of labour interests should have a due sense of their responsibility, and that employers should have a larger power of control than they seem at present to possess.

Messrs. Armstrong, Mitchell & Co. have launched during the month a Japanese battleship and a Chilian cruiser from their yard at Elswick. The keel for another cruiser has already been laid in one of the vacated berths, and the other berth is being rapidly cleared, preparatory to its re-occupation by another war vessel. The keels for two Norwegian cruisers are being placed at the company's Low Walker Yard, which is more completely filled with ships of various types in course of construction than perhaps any other shipbuilding establishment in the kingdom. There are no less than ten vessels on the stocks—exclusive of the Norwegian cruisers—an accumulation of work which bears striking testimony to the capacity of the yard, and the energetic character of the management.

Messrs. Wm. Dobson & Co. have two vessels ready for launching, and one is in an early stage of construction. The firm are fitting out in the river two vessels of special type, ordered by Russian owners, and it is understood they have recently booked an order for a vessel of large dimensions. Messrs. Wigham Richardson & Co. are completing the equipment of the s.s. *Elizabeth Rickmers* and the s.s. *Loongmoon*, both of which have been launched within the month. The firm continue to be very busy in the initiatory department of shipbuilding, and the deliveries of material in the yard have been very heavy lately.

It is announced that Messrs. Hawthorn, Leslie & Co. have received from the Admiralty an order for two of the additional torpedo destroyers provided for in this year's Naval Estimates. They are to have a speed of 30 knots, and will in other respects be superior to the vessels of similar type that have been built previously. It is stated that the Palmer Co. have also been commissioned to build two of these boats, and there can be no doubt that both the firms named have proved their title to the confidence reposed in them by those in authority. The performances of the torpedo destroyers that have up to the present been supplied from the Tyne, have been in the highest degree satisfactory, and it would be strange indeed if the efforts of the builders to reach the highest standard of excellence in the work turned out by them, were not recognized in the manner indicated. The Palmer Co. have three merchant ships building at their Jarrow yard, and the keels for two large vessels have just been laid. At the company's Howdon yard six torpedo destroyers have been put down, and one of them is already plated. Another portion of the yard is being got ready for the putting down of the two third-class cruisers recently ordered by the Admiralty.

Messrs. C. S. Swan & Hunter have launched this month the second half of the great pontoon dock which they have built to the order of the Smith's Dock Co., North Shields. The dock is a unique structure, and will prove a most important addition to the repairing facilities of the port. The fine vessel *Leitrim*, built for Messrs. Hudson, of Sunderland, is being fitted out beside the yard, and there are five large vessels on the stocks. The erection of a second covering shed is proceeding steadily, and when this is completed it will be possible to build two vessels simultaneously under cover. The firm have electric overhead cranes to work three berths, which are each 70 ft. wide, and of practically unlimited length.

Messrs. Robert Stephenson & Co. have just placed the keel for a small locally ordered vessel, and are completing a massive caisson, or dock gate, for a port on the west coast. The Tyne Shipbuilding Co. have three large vessels in progress, and it is understood that there is other work to follow. The firm have launched two very fine vessels this year—the s.s. *Tropic*, for Mr. E. C. Thin, of Liverpool; and the s.s. *Fitzpatrick*, for Messrs. Burrell & Son, of Glasgow—the aggregate carrying capacity of which is not far short of 12,000 tons. They will probably launch other two vessels by midsummer, and will, no doubt, turn out an equal quantity of work in the second half of the year.

Messrs. Readhead have two vessels in the framing and plating stages, and two others for which the keels are laid. Frame-turning is still proceeding briskly, and throughout the various departments the signs of abundant work are unmistakable. There are a couple of vessels being fitted out at the quay, and in the repairing department business is quite active. Messrs. Eltringham have several small vessels on the stocks, and are very busy in the boiler making department.

Engineering.—The leading marine engineering establishments are now well supplied with work, and though business has not yet reached what might be described as a state of full activity, the condition of affairs in connection with this branch of industry, is, on the whole, satisfactory. The St. Peter's works of Messrs. Hawthorn, Leslie & Co. are kept running night and day, and the same may be said of one or two other establishments further down the river. Locomotive shops are still inactive, and in reference to one well-known establishment, it is rumoured that an important change is impending. The engineering department at the Elswick works have become very busy lately, and considerable additions are being made to the complement of men employed.

Messrs. Carrick & Wardale have a good supply of work in their engineering shops, the demand for their well-known steam-feed, bilge, and ballast pumps, being well maintained. At Messrs. Clark, Chapman & Co.'s works, business is brisk in both the electrical and engineering departments, and during the present year the output of steam winches and other deck accessories has been quite equal to the output in corresponding periods of former busy years.

Messrs. Donkin & Co. (late Donkin & Nichol), of the St. Andrew's Engine Works, are among the firms that find it necessary to keep the machinery running beyond the ordinary hours, to enable them to meet the requirements of customers. They have now in progress, steering gears, ash hoists, blowing and exhausting fans, workshop engines, &c., for firms on the Continent, as well as in various parts of the United Kingdom, and there is every reason to believe that the present year's output of steamship specialities will be exceptionally large.

Both forges and iron foundries have begun to show evidences of improving business, and it will not be long till brass foundries and copper-smithing works will participate in the improvement. Steel and iron works have become distinctly busier, and an improvement is also noticeable in connection with the chain and anchor manufacture. Mr. George Tyzack, of the Tyneside Anchor Works, South Shields, is just now exceedingly busy, the orders in hand, especially for his patent "triple-grip" anchor, being very numerous. This type of anchor is now in great request, having become celebrated for its extraordinary holding power, and general reliability in emergencies. Among the vessels lately supplied with the "triple-grip" anchors is the s.s. *Dido*, built by Messrs. The Earle's Shipbuilding Co., Hull, for Messrs. Thos. Wilson & Sons, of the same port, and which is said to be the largest cargo boat sailing from the Humber. These anchors are of enormous size and weight—almost equal indeed, to the class of anchors that are usually supplied for the equipment of battleships.

The Holzapfels' Compositions Co., Limited, have extended their manufacturing premises at Gateshead, with a view to increasing the productive capacity. The steadily-growing demand for their anti-fouling paints, and other compositions has, we understand, made this step necessary.

THE WEAR.

Shipbuilding.—It has not transpired that any new orders have been placed with Wear shipbuilders during the month, and the number of vessels on the stocks has rather decreased than otherwise.

Messrs. W. Doxford & Sons do not appear to be quite so busy as they were earlier in the year, and one or two of their building berths are vacant. It is not at all likely, however, that the firm are short of work, and we do not doubt that all the berths will soon be occupied.

At the yard of Messrs. Short Brothers work continues plentiful, and at Messrs. Priestman & Co.'s there is also a full supply of orders. Messrs. Osborne & Graham, Messrs. Pickersgill, and Messrs. R. Thompson & Sons are, however, still short of work, each of the last named firms having but one vessel on the stocks.

A destructive fire which occurred in the saw-mill department of Mr. Laing's works, has tended to impede the finishing of vessels recently launched; but by setting on extra hands the firm have been enabled to successfully cope with requirements.

There was a large amount of valuable machinery destroyed, as well as the roof, flooring, &c., of the building; but the work of restoration has gone on with amazing rapidity, and it is probable that, in less than a fortnight from now, the place will be again ready for work, with an even more complete equipment of machinery than it formerly possessed. It is understood that overtime will be resorted to as soon as the restored premises are ready for the resumption of operations, as practically all the vessels to be built this year in the yard are of a class in which more than an ordinary share of joiner work is requisite.

Messrs. Austin have launched a vessel this month, and have placed a keel in the vacated berth, and at Messrs. Blumer & Co.'s yard a considerable stimulus had been given to business by the laying down of two keels, for a passenger and cargo boat respectively.

A temporary lull has been experienced at the North Sands yard, but large deliveries of material are now expected to take place, and it is hoped that the customary briskness will soon again be apparent.

Engineering.—The various sections of operatives connected with the engineering industry have received advances of wages, varying from 1s. to 1s. 6d per week, and it is felt that for a few months, at all events, a most welcome immunity from trade disputes is assured. A rise in the wages of operative engineers was bound to follow an advance in the wages of operative shipbuilders, and there is not the least doubt that one class was as much entitled to consideration as the other. It remains to be seen, however, whether either class will benefit very greatly by the change, for it is not beyond the range of possibility that they may lose by diminished employment more than they have gained by the increase of wages.

Excepting at the Southwick Engine Works (Messrs. George Clark & Co.), there does not not appear to be any special pressure of work at any of the local engineering establishments. In some instances, indeed, there is at present a notable absence of briskness, but expectations are entertained that a change for the better may be experienced shortly.

Messrs. Jameson & MacColl, of the Wreath Quay Engine Works, have booked an order for a set of paddle-wheel engines for a steamer to be built at Middlesbro', and have also booked orders for several auxiliary boilers, for vessels building on the Wear.

Messrs. John Lynn & Co. are well provided with work of the special class in connection with which they are so well known, such as steam winch and other deck accessories, and at the Sunderland Forge, where the work of extension is being steadily pursued, there is an adequate amount of work in hand to keep the machinery in full operation.

Messrs. Cook & Nicholson, of the Wear File Works, are well supplied with orders in their particular line, and owing to the unique facilities at their command, are enabled to turn out a very large quantity of work each week. This, we believe, is the only firm in the North engaged in the file manufacture, and as they only make goods of a first-rate quality, both as regards material and workmanship, they have achieved a very high reputation, which doubtless accounts for the unvarying activity in their works.

The Hartlepools.—Recent launches have caused vacancies in the building berths at some of the Hartlepool yards which have not yet been filled up, and the outlook at this centre is, so far as shipbuilding is concerned, less cheerful than it was a few months ago. At Messrs. T. Richardson & Son's engineering establishment there is a considerable amount of work in hand, and the various departments are kept steadily employed. Several of the engines in progress are arranged for a working pressure of 210 lbs. per square inch, and in view of the highly satisfactory results that have already been obtained from triple-expansion engines at this pressure, there is reason to believe that 200 lbs. and upwards will soon become general. The s.s. *Selma*, which is the second of three steamers that are being engined for the firm by Messrs. George Horsley & Son, of West Hartlepool, recently proceeded to sea after a satisfactory trial of her machinery, and the s.s. *Dorothy* has also been delivered to her owners, Messrs. Allison & Co., of West Hartlepool. At present Messrs. Richardson & Sons are engaged fitting the machinery on board the s.s. *Albertville*, a large cargo and passenger steamer built by Sir Ralyton Dixon & Co. for Messrs. Elder & Dempster's fleet, running to the west coast of Africa. Rapid progress is being made with the new forge, the machinery equipment of which will be of the most complete description, to meet modern requirements and enable the firm to undertake the manufacture of the very heaviest class of forgings. In the departments devoted to the manufacture of the firm's different auxiliary specialities, exceptional activity prevails, and the demand for Morison's evaporators is still rapidly increasing.

Stockton.—Messrs. Ropner & Son are understood to have secured one or two orders lately, but otherwise there is little change to note in connection with shipbuilding prospects at this centre. The various departments of Messrs. Blair & Co.'s works are kept steadily going, and now that both the questions of overtime and fitters' wages have been amicably disposed of, there appears to be no reason to doubt the continuance of steady work at this establishment for some time to come. Boiler and bridge building works are well employed, and in the local steel and iron works business is good.

Middlesbrough.—Messrs. Raylton Dixon & Co. continue to have a good show of work on the stocks, most of the vessels being of large size, and intended for special services. Messrs. Craggs & Sons have booked some additional work lately, and are commencing operations in their new premises under very favourable auspices. There is a fair amount of repairing work in the port, and on the whole the outlook is encouraging. Messrs. Westgarth & English are reported to have booked some orders lately, and most of the smaller engineering establishments are fairly well off for work. Steel works are busy, and in the docks business is improving.

Darlington.—We are enabled to state that the Darlington Forge Co. are at present very busy in all their departments, with general work of good size. Railway waggon works at this centre are kept fairly busy.

Consett.—Throughout the different departments of the Consett Co.'s works trade is active, and a large weekly output of ship and boiler plates, angles, &c., is maintained.

THE MERSEY.

(From our own Correspondent.)

EXCEPT a lull in the weight of buying during the past month in all descriptions of raw material, which, however, has been due mainly to over-purchases on the part of both merchants and consumers, the general condition of trade continues very healthy, and although, for pig-iron, prices have given way slightly, the general industries of the district continue not only fully engaged, but there is a steadily increasing weight of new work coming forward in all branches of engineering. Activity is now generally well-assured over the remainder of the year, and some of the principal machine toolmakers have had orders coming forward which will carry them well into next year. Marine engineering branches especially are feeling the effects of the unprecedented activity in the shipbuilding industry, and the well-known machine toolmakers in this district have large and important orders in hand or in prospect for various branches of the shipbuilding trade.

Messrs. Laird Bros., of Birkenhead, continue busily engaged in the construction of war vessels of various types, both for the British and foreign Governments, and are also making rapid progress with the four Irish mail-boats, for the Holyhead and Kingstown service, the first of which is nearly ready for launching. The chief event, in connection with the above firm, during the past month, was the floating from one of their building docks of the 14,900 tons battleship H.M.S. *Mars*, which is referred to in the present issue of MARINE ENGINEER. It may be added that the firm have also launched during the past month the *Almirante Simpson*, one of the torpedo-boats which Messrs. Laird are building for the Chilian Government. This vessel has a length over all of 240 ft., with a beam 27 ft. 6 in., and a depth of 16 ft., and measure 358 tons o.m. The forecastle and half poop provide good accommodation for the officers and crew, and there is a fore and aft bridge at the height of forecastle deck connecting with the poop, the casings of the hatchways and engine-room skylights being raised to this level, whilst the openings on the main-deck level are watertight. The hull is subdivided into numerous water-tight compartments by transverse bulkheads, and longitudinal bulkheads divide the two sets of engines and extend along the outer side of the machinery spaces, so that greater power of flotation is ensured in case of injury. The side and deck plating abreast the machinery spaces is of increased thickness so as to afford protection. The armament consists of one bow and two broadside torpedo-tubes, two 4·7 guns, four 3-pounder quick-firing guns, and two machine guns and firing plant. The machinery includes two sets of the firm's high speed triple-expansion engines developing 6,000 I.H.P. collectively, driving twin-screws. The four Nomand tubulous boilers have 200 lbs. working pressure, and the speed of the vessel will be 21 knots.

In the general engineering trades the position is one of continued improvement generally. Machinists are fairly well employed. Machine toolmakers are all kept busy on orders both for home and abroad, and heavy stationary engine builders continue fully engaged. Boiler-makers have recently been securing more work than for a considerable time past, and locomotive builders report orders coming forward steadily, some fairly large contracts having been placed with Lancashire firms during the past month, and in the general engineering industries establishments are mostly in a satisfactory position as regards work in hand.

The usual monthly returns issued by the trades unions' connected with the engineering industries show a further decrease in the number of unemployed members on the books, and increased activity generally throughout the principal engineering centres of the country, the position, as indicated by the returns being, in fact, more satisfactory than it has been for many years past. The Amalgamated Society of Engineers has now on benefit less than 3 per cent. of the total membership, and it is expected that this percentage will be still further reduced during the next few months. In this immediate district there are only about 2 per cent. of the local membership on donation, establishments here being now practically all fully employed. The out-of-work list of the Steam Engine Makers' Society has fallen to 1 per cent. of the total membership, which is only ½ per cent. above the lowest percentage ever recorded by the Society. The reports received by the above societies from the different districts as to the state of trade, are much to the same effect as last month—new work coming forward steadily in practically all departments, including branches of trade in which quietude had prevailed for some time past. One of the most satisfactory features of the returns is the indication they afford of increasing activity im marine centres, the unemployed list in such districts having undergone a substantial diminution during the last few months.

Messrs. B. & S. Massey have recently completed two very massive and powerful steam stamps for a large shipbuilding firm in the North of England. These stamps, which are designed for stamping parts of guns, and have each a falling weight of 15 cwt., have been made in the pillar form, the tup sliding between round iron pillars which are hollow tubes, and strong stout bolts pass from the bottom of the base-block to the nuts at the top of the stamp, binding the whole firmly together. The stamp is double acting, steam being employed not only for lifting, but also for accelerating the fall of the tup. The firm have also completed a large foreign order, including six hammers of the Rigby type, with framing composed entirely of riveted steel plates and angles, this arrangement reducing the risk of breakage through carelessness in transhipment and also the cost of transport. The hammers are of the 5 cwt. and 10 cwt. sizes, and fitted with the firm's combined self-acting and hand-worked valve gear. In order to afford the greatest possible working space for operating the hammer, an exceptionally large over-hang, or space from the anvil pallett backwards, is provided.

The other day we had an opportunity of inspecting a specially-designed painting machine, which Messrs. A. C. Wells & Co., of Manchester, had in hand for the Liverpool Overhead Railway. This machine, in which the air-compressor is driven by an electric motor, is fitted with two "Lightning" painters—similar in arrangement to those described in MARINE ENGINEER some time back—on a car suitable for running on the street tram lines below the railway, and the machine can be worked at any point along the line by an electric current, supplied from the company's own installation. Amongst other modifications and improvements in connection with the "Lightning" painters brought out by the firm, in connection with Messrs. Henry Wallwork & Co., is a portable self-contained machine, with air-pumps, paint-receivers, and all the requisite apparatus carried on one small baseplate fitted with wheels and a couple of handles, arranged in truck form, so that it can be quickly wheeled from one place to another. The mixing arrangement in the portable machine is automatic, and operated by the turning of the crank which actuates the air-pumps, worked by hand, which supplies the compressed air required for forcing the paint through the nozzles and for spraying the paint. The whole apparatus weighs less than a cwt., and is complete in itself.

A very handy form of truck, specially suitable for railway, dock, and wharf requirements, has been brought out by Messrs. Mitchell Bros. & Co., of Patricroft. In this truck, which is called the "City," the chief feature is a collapsible framework, by means of which the truck can be used in three different positions. With the framework folded and fastened by catches to the truck-bottom, an ordinary truck is formed capable of carrying a sack, case, barrel, &c. In the second position, with a strong iron flap fixed at the back, several boxes and parcels can be conveyed; and in the third position, with the whole of the framework arranged at the truck sides, a large box is formed, in which a number of loose, heavy packages can be carried with safety, and a box or package of any kind up to 2 cwt. may, even in the ordinary-sized truck, be placed on the top of the other packages without risk of damage to the parcels beneath. A waterproof cover is supplied, if required, at a small extra cost. The truck can be used in place of a hand-cart, and takes up no more room than a sack-truck, whilst it is perfectly balanced throughout, the shafts being of hickory and the wheels fitted with rubber tyres. The ordinary-sized truck of this design is guaranteed to carry 4 cwt.; but specially-designed larger trucks are constructed for railway and other heavy work, and they are also made to suit the requirements of any trade, wooden sides being provided, if required, instead of wirework.

In the iron trade only a very slow business has been doing all through the month, but makers, being kept well engaged on contracts placed during the recent heavy buying, have generally maintained late quotations. Towards the close, however, Lincolnshire pig-iron makers created some surprise by deciding to reduce their list rates 1s. per ton, the explanation being that Northampton pigs have recently been offered at such extremely low figures that the important Staffordshire trade in Lincolnshire pig-iron has been almost, if not entirely, lost, and that it is solely with a view of recovering this trade that the reduction has been made. For other brands of pig-iron makers' quotations are nominally unchanged, but in the open market prices are very irregular, merchants, in fact, making their own quotations according to circumstances, and the general tone of the market is weaker. Local makers still quote 46s. 6d., less 2½ for foundry qualities, and are firm at these figures, and it is only where they come into competition with Lincolnshire forge iron in the Warrington finished ironmaking district that they will be affected by the reduced rates. Makers now quote 41s. for forge to 43s. for foundry Lincolnshire, with 46s. to 47s. still asked for foundry Derbyshire, net cash, delivered Manchester; but the position of Derbyshire makers is not so strong as recently, and only a very limited business is reported at these figures. Outside brands have eased down considerably, merchants being particularly low sellers, with makers not in so strong a position as recently. For good foundry Middlesbrough, makers quote about 47s. net cash; but orders could be placed in the open market at 46s. 3d. to 46s. 6d., delivered by rail Manchester; and 44s. 9d. to 45s., net cash, are about the average figures for delivery at the Manchester Docks; whilst in Scotch iron Eglinton is obtainable at 47s., and Glengarnock 47s. 6d., net prompt cash, delivered Lancashire ports, with about 2s. 6d. more for delivery Dock Quays, Manchester, although makers quote 6d. to 9d. above these figures.

In the manufactured iron trade business comes forward in moderate weight, and with forges kept fully employed, prices are generally steady at recent quotations, Lancashire bars not being obtainable under £5 10s., and North Staffordshire qualities £5 12s. 6d. Sheets, however, with the close of the month have shown some weakness and irregularity in price, and could be bought at fully 2s. 6d. below recent rates, £7 5s. to £7 10s. being now the average figures. Hoops are without change, and remain firm at the Association list rates of £6 2s. 6d. for random, to £6 7s. 6d. for special cut lengths, delivered Manchester district, and 2s. 6d. less for shipment.

No material change is noticeable in the steel trade, prices being firm at late rates. Hematites are still quoted by makers at 58s. and 58s. 6d., less 2½ delivered here, whilst ordinary steel billets average about £4 7s. 6d. to £4 10s., and steel boiler plates £6 7s. 6d., delivered in this district.

In the metal market an active business has been doing all through the month, and manufacturers were able, for a week or two, to obtain a ¼d. per lb. advance on the official list rates for brazed brass and copper tubes, but this is now scarcely possible. List rates, however, are firm at late quotations, averaging, for delivery in Manchester district:—Solid drain brass boiler tubes, 6½d.; brass surface condenser tubes, 8d.; copper tubes, 7¾d.; brazed copper gas and steam tubes, 7½d.; brazed brass gas tubes, 7¼d.; machine tubes, 7d.; brass wire, 6d.; copper wire, 7½d.; and rolled brass, 6d. per lb.

In the timber trade a fairly satisfactory demand is reported, with imports only moderate, and prices steady. Deliveries generally have exceeded the imports, and stocks, as a rule, are light. In East India teak the bulk of the import has gone direct into consumption, and the stock is about an average. Prices for squares have advanced, and there is a continued upward tendency, whilst good qualities of planks are also fetching higher prices, but have not advanced to the same extent as squares. Of greenheart there have been no arrivals, and prices are firm, with stocks light.

Business in the coal trade, which has necessarily been considerably interrupted on account of the holidays—for which pits were generally closed three or four days—continues extremely slow, and although collieries are, as a rule, only working about four days per week, supplies of round coals are in excess of the demand. House coals move off fairly well considering the time of year, and are steady at about late rates, although concessions would, in some cases, be made on sales of any magnitude. Best house coal averages about 10s., seconds, 8s. to 8s. 6d., and common house coal 6s. 3d. to 6s. 9d. per ton at the pit mouth. Steam and forge coals are in but limited request, and with the keen competition to effect clearances as well as for ordinary business, prices are cut extremely low, ordinary qualities averaging about 6s. at the pit. Engine fuel meets with a ready sale, some of the better qualities being rather scarce, and attempts have been made to secure advanced prices, but with little success. A steady tone, however, is maintained at late rates, ranging from 3s. to 3s. 6d. for common, to 4s. and 4s. 6d. for better sorts, with 5s. for special qualities at the pit mouth.

The shipping trade remains without improvement, a depressed tone prevailing generally, with prices as low as ever, 6s. 9d. to 7s. 3d. representing about the average figures obtainable for common steam coals, delivered at Garston Docks, or High Level, Liverpool, or at the Partington tips, Manchester Ship Canal.

BELFAST TRADE NOTES.

(*From our own Correspondent.*)

BUSINESS still continues very brisk in the engineering and shipbuilding trades on this side of the Channel. Very little can be written about it, however, as the output has been small. The Easter holidays, too, interfered with work, and a trifling dispute threw all the pattern-makers in Messrs. Workman, Clark & Co.'s shop idle for nearly a week. This has been, fortunately, amicably settled and work resumed.

There are no launches to notice this month, but several vessels of large tonnage will, it is expected, be floated during May.

Messrs. Harland & Wolff have now got the s.s. *Pennsylvania*, the Hamburg-American liner they are building, nearly in frame, and the engines are progressing satisfactorily at the same time. This steamer, when launched, will be the largest vessel afloat, and will be fitted with quadruple-expansion twin-screw engines and all the most up-to-date auxiliary machinery.

The same firm have also in hand a passenger steamer of 8,000 tons, for the Peninsular and Oriental Steamship Co. She is to be named the *China* and is similar to the *India*, recently built by Messrs. Caird & Co., Greenock. Her speed will be about 17 knots.

Another passenger steamer for the cross-channel service of the Belfast Steamship Co. will also be launched shortly from the Queen's Island yard. This boat will be 235 ft. long and propelled by twin-screws. She will be somewhat similiar to the *Magic*, also built by this firm and now running between Belfast and Liverpool.

The twin-screw steamer *Iran*, for Messrs. Bates, Liverpool, is now nearly completed and will leave this port about the end of the month. The single screw steamer *Istrar*, for the same owners, lies inthe Abercorn Basin awaiting her machinery.

The s.s. *Langton Grange*, the new frozen meat carrier, launched by Messrs. Workman, Clark & Co. for Messrs. Holder Bros., London, on February 29th last, is now ready for sea. The finishing touches are being put to her extensive refrigerating plant fitted on board by J. & E. Hall, Dartford, and the vessel will leave this port in a few days. A sister ship, named the *Denton Grange*, will shortly take the water. Should these vessels prove as successful as the *Urmston Grange*, the latest addition to the Grange Line from the Belfast shipyard, neither owners nor builders will have reason to be dissatisfied. This fine steamer has just completed her second voyage out and back to Australia. The voyage out was accomplished in 48 days, and the average speed was 11¼ knots per hour. The engines were never once stopped on the passage. The coal consumption averaged about 25 tons per day. On the return voyage she shipped over 80,000 carcases of sheep, and a quantity of pure copper, besides a large general cargo. I understand that the s.s. *Southern Cross*, built here about four years ago, will shortly have her name changed and become one of the Grange Line.

The *Patroclus*, the first of the two steamers which Messrs. Workman, Clark & Co. have on order for Messrs. A. Holt & Co., Liverpool, is now receiving her machinery at the sheer legs. The second vessel is also well on, and will be launched in a short time.

Several steamers have undergone overhauls at the hands of this firm during the past month, among them being the s.s. *Aurie*, which is having a new crank shaft fitted.

The s.s. *Lismore* left the port early in the month, after having damages repaired.

Messrs. Workman, Clark & Co. are already finding their boiler shops too small for the work they have in hand, and are accordingly adding two new spans to it. This necessitates a large amount of work in pile driving on account of the softness of the ground.

In the harbour, too, considerable improvements are being made. The Blue dock has been extended to meet the Prince's dock, thus giving a considerably larger area for shipping.

NORTH-WEST OF ENGLAND.

(*From our own Correspondent.*)

Barrow-in-Furness.—General activity has been noticeable in the shipbuilding and engineering trades of Barrow during the past month, although the fact that several of the contracts in hand are being gradually finished, has resulted in the discharging of several workmen in various departments pending the receipt of new orders. This state of things is more especially observable in what are known as the initial departments. In the last week of the month an order was received from the Admiralty for the building of two torpedo-boat destroyers to steam 30 knots, of similar dimensions and power to those already in course of construction here, viz., the *Avon* and the *Bittern*. The Naval Construction and Armaments Co. have also tendered more recently for the building of torpedo-boat destroyers of even a higher rate of speed—32 to 33 knots per hour—and it is thought quite probable the Admiralty will give some orders out for this high speed class of craft. No other orders have come to hand at Barrow during the month, but there has been a fair demand for various types of commercial tonnage, and some of the contracts open are expected to be secured here. Towards the close of the month the demand for new commercial steamers improved very considerably, and it is evident the shipbuilding trade is on the eve of a period of greater activity than has been the fact for some considerable time past. It is also known that some important Admiralty work has yet to be given out to private builders, and the hope is very naturally indulged in Barrow that some of the heavier ships to be built will come to Barrow. Already one of the largest cruisers in the world has been built at Barrow, and the yard of the Naval Construction and Armaments Co. is not only admirably adapted for this class of work, but for line-of-battle ships as well. The only commercial orders now on hand are the building of the s.s. *Clan Sutherland* for the Clan Line, Limited, and the tripling of the *Clan Sinclair* of the same line. The *Clan Lindsay*, launched last month, is ready for sea, and will next month be put on her station. Very marked progress has been made in the work of completing H.M.S. *Powerful.* She is now practically ready to take her dock trials. All her Belleville boilers, 48 in number, have been officially tested, and are proved to be highly satisfactory, and her main engines and auxiliary engines are all ready to turn round. The shipbuilding department of the great cruiser is also as well forward as the engines and boilers, and in the course of a few days preliminary trials will be made in view of the completion of the cruiser to be ready for delivery before the end of June. If this feat is accomplished, it will speak well for the capacity of Barrow builders, who in their first order for a bigger cruiser than ever previously built by any firm in the world, are able to turn her out and hand her over to the Admiralty in two and a half years, or six months less than the time allowed by the Admiralty in the contract. It is also a further proof of the great capacity of the country to produce the highest class of fighting machine in the shortest space of time, either for the home Government, or for a foreign power. H.M.S. *Juno,* a second-class cruiser, is in a fair way towards completion, and will be ready for delivery soon after the *Powerful,* while a sister ship to the *Juno,* the *Doris,* is already fitted with her engines and boilers, and will be completed by the autumn of the year. In the engineering department business is brisk, and there is a prospect of some good repair orders.

Whitehaven.—A few weeks ago a meeting of the inhabitants of Whitehaven was convened with the object of considering what could be done to improve the trade of the town in the direction of promoting new industries or resuscitating old ones. The meeting had special reference to the much-desired object of restarting the Whitehaven Shipyard, which has been closed for many years. Whitehaven has an ancient history in wooden shipbuilding, and many schooners, brigs, brigantines, and even full-rigged ships of the old school were built here and did good service in their day and generation. But about twenty or thirty years ago an iron shipbuilding yard was opened at Whitehaven and prospered fairly well for some time, but when the price of tonnage came down it was found difficult to make ends meet, and one or two accidents at launches, in which the ships stuck on their ways, helped to bring about the climax and the works were closed. The liquidators of the company offered the works for sale to any likely buyer, but as years passed away nothing seemed to come of it, and it was ultimately resolved to sell off the works and close the estate. For this purpose a sale by auction took place, and Lord Lonsdale, who is the Lord of the Manor, and largely interested in Whitehaven and West Cumberland in general, became the purchaser, with the view of stopping any chance of dismantling the works, and in the hope that at some time, when opportunity offered, the place would be restarted. So cheaply were the works sold that they have been, and are still, offered to a likely tenant at the modest rent of £50 per annum. At the recent meeting of Whitehaven tradesmen it was stated that Lord Lonsdale had expressed himself very strongly in favour of restarting the yard if opportunity served, and it could be put on a basis likely to pay. His Lordship, it was further stated, had met with encouragement from the Duke of Devonshire, who is largely interested in the big yard at Barrow. The Whitehaven tradesmen are ready to enter into the scheme with some spirit, and to find a fair proportion of the capital required. It was decided that a deputation should wait upon Lord Lonsdale on the first occasion of his visit to the town, of which he is the Mayor for the time being, and urge his lordship to the expediency of restarting the yard under the auspices of a new company and under competent management. Mr. Helder, M.P. for the borough, is prepared to help forward the scheme financially and in every way he can, and there is reason to believe that if the proposed new concern is commenced on an economical and careful basis, there is money to be made out of the yard, and that a profitable source of employment will be found for workmen. Many Whitehaven shipwrights are now employed at Barrow and would doubtless like an excuse to return home. At one time the yard at Whitehaven was surveyed for the Admiralty, and it was put on the list as suitable for the building of gunboats and the smaller craft of vessel required for the Navy. It is felt with the wonderful impetus recently given to Admiralty work in the yards of private builders it is within the bounds of possibility that were the yard restarted some of the Admiralty work given out would go that way. Of course much of the plant is obsolete and would require replacing, but Whitehaven is conveniently situated for a successful shipbuilding trade as steel shipbuilding material is largely produced in West Cumberland. The yard is well adapted for shipbuilding purposes, and with a little expense in dredging occasionally there will always be a good launching way.

Workington.—Shipbuilding is very brisk at Workington. Messrs. Williamson & Son have booked orders for ten barges and a coasting steamer, which, with the five vessels in hand, will ensure regular employment for some time to come.

Maryport.—A very steady trade is being done in shipbuilding at Maryport, and the builders there are not only well employed, but have every prospect of a continuance of orders when those at present engaging their attention have been disposed of.

The Hematite Trade.—Business in hematite pig-iron has been very brisk and steady during the month, and the consumption of Bessemer qualities especially has been large. Makers are very well sold forward, and it is evident additional furnaces will have to be put in blast as the consumption of metal is greater than the output, with the result that stocks are being gradually reduced. The value of mixed Bessemer now stands at 50s. per ton net f.o.b., and warrant holders are asking 48s.

Shipbuilding Material.—There is a marked demand for ship plates, boiler plates, angles, forgings, castings, and all descriptions of shipbuilding material manufactured in this district, but the demand is greater than the supply, and steel makers having such a brisk all round demand for their productions are unfortunately not at the moment in a position to feed their mills with as much metal as they require to keep them regularly employed. This, however, will be forthwith remedied by the building of additional Siemens-Martin's furnaces. Ship plates are quoted at £5 2s. 6d. per ton, and there is a good demand as well on local as on general account.

Shipping.—There is a marked improvement in the shipping trade of the West Coast. The exports of pig-iron up to April 18th had reached 94,771 tons, and of steel 131.222 tons, as compared with 78,888 tons of pig-iron and 110,169 tons of steel in the corresponding period of last year, an increase of 15,883 tons of pig-iron and 21,035 tons of steel. Further improvement in the shipping trade is expected, but freights are low, and some ships are laid up.

Tobin Bronze.—The Ansoma Brass and Copper Co., who are the sole manufacturers of the Tobin bronze, have favoured us with a small pamphlet giving particulars of their new product. From this we gather, *inter alia,* that this metal was used in the construction of the hull of the American (cup defender) yacht *Vigilant,* and that after two ocean passages, in the quickest time ever made by a yacht, the hull was found to be entirely free from corrosion. The weight of a cubic inch of the bronze is ·3021 lbs., as against ·3176 lbs. for copper, a considerable gain as regards lightness. When tested for tensile strength, two rolled Tobin bronze plates, ¼ in. thick, and two plates, 3-16th in. thick, averaged 79,145 lbs. per square inch, and the elastic limit of the plates averaged 53,787 lbs. per square inch, figures which compare most favourably with those usually given by mild steel. Six one-inch rolled rods of this bronze turned down to 5-8th in. diameter when tested, averaged 79,600 lbs. per square inch, the elastic limit of three of the rods being reached at 54,257 lbs. At a cherry red heat this bronze can be forged or stamped, either by hand or machinery, as readily as steel, or it can be drop-forged. When finished it has a bright golden colour, and after exposing two samples, for five months, to the action of, respectively, saturated solutions of salt and caustic soda, they were found to be unchanged. A 9-10ths solution of sulphuric acid discoloured the plate exposed to it, but in five months only caused the loss of ·014 oz. out of the plate's original weight of 5·527 oz. The address of the company is 21, Cliff Street, New York.

Perseveance.—On March 21st the *Perseverance,* a steel sailing barque of about 3,062 tons gross, was launched at La Seyne, owned by Messrs. A. D. Bordes & Co., Port of registry, Dunkirk.

Patroclus.—On March 31st a steel schooner-rigged steamer, of 4,800 tons gross, named the *Patroclus,* was launched at Belfast, owned by the Ocean Steamship Co.

Montmorency.—On March 16th the *Montmorency,* a steel sailing barque of about 2,960 tons gross, was launched at Nantes, owned by Messrs. A. D. Bordes & Co., Port of registry, Dunkirk.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES.—English.

Umooti.—On March 25th a steel schooner-rigged steamer, of 2,627 tons gross, named the *Umooti*, was launched at Sunderland, owned by Messrs. Bullard, King & Co., of London.

Nelson and Elsie.—On Thursday, March 26th, there was launched from the yard of Messrs. Cochrane & Cooper, at Grovehill, a new steam trawler of 93 ft. 6 in. by 20 ft. 6 in., by 10 ft. 8 in. depth of hold, built to the order of Mr. J. Grant, of Grimsby. The vessel, which will be fitted with 40 H.P. triple-expansion engines by Messrs. C. D. Holmes & Co., of Hull, was christened the *Nelson* by Miss Clara Grant. On Saturday, March 28th, there was also launched from the same yard a fine steam trawler, 110 ft. by 21 ft., by 11 ft. 3 in. depth of hold, built to the order of Mr. G. T. Armitage, of Hull. The vessel, which was christened the *Elsie* by Miss Elsie Lynn, is to be supplied with 60 H.P. triple-expansion engines by Messrs. C. D. Holmes & Co. On both occasions the company proceeded to the "Beverley Arms," where luncheon was partaken of, and the usual toasts proposed and responded to.

Orion.—On March 26th a steel schooner-rigged steamer, of 459 tons gross, named the *Orion*, was launched at Sunderland, owned by the Koninklyke Nederlandsche Stm. Maats.

Jamaica.—On March 26th an iron steam ketch, named the *Jamaica*, was launched at Hull, owned by the Hull Steam Fishing & Ice Co., of Hull.

Eller.—On March 27th Messrs. John Fullerton & Co. launched, from Merksworth building yard, a small steel screw steamer, which has been built to the order of Mr. Robert Simpson, Whitehaven, for his coasting trade. Compound engines of 45 N.H.P. will be supplied by Messrs. Ross & Duncan, Whitefield Works, Govan. The vessel was named the *Eller*.

Turret Steamer.—On March 28th another turret steamer was launched from the yard of Messrs. W. Doxford & Sons, Pallion. She is 5,600 tons deadweight capacity, and will be engined by the firm. This is the twentieth vessel of this type now afloat.

Owl.—On March 28th an iron and steel ketch-rigged steamer, of 120 tons gross, named the *Owl*, was launched at North Shields. Owned by the Cleethorpe Steam Trawling Co., Limited. Port of registry, Grimsby.

Elizabeth Rickmers.—On Saturday, March 28th, Messrs. Wigham Richardson & Co. launched from their Neptune Shipyard a steel screw steamer, which they are constructing for the well-known Rickmers Co., of Bremen, built of steel on the web-frame principle, 427 ft. in length, 50½ ft. beam, and 30 ft. depth, and carrying about 7,200 tons deadweight of cargo on a moderate draught of water, and being intended for the Eastern trades, she is fitted with every accommodation for a limited number of passengers in the citadel amidships The arrangements for warping and for discharging cargo are very extensive and with other appliances include eight steam winches as well as various other steam deck gear, &c. Unlike other vessels of her class the *Elizabeth Rickmers* is built with a clipper bow and a female figure by Allan, which it is hoped will satisfy the artistic feelings of her owners, who are well known in Germany as patrons of art, and whose residence at Vahr contain Fitger's frescoes of the "Midsummer Night's Dream." She will be rigged as a two-masted schooner, and her lower masts will be of such a length that she can go up the Manchester Ship Canal in ballast. The propelling machinery is of the quadruple-expansion type, working at 215 lbs. pressure and self-balanced according to the Yarrow, Schlick & Tweedy system, and is also being constructed by Messrs. Wigham Richardson & Co. Quadruple engines balanced according to this system are now becoming well known and extensively used, not only because of the saving in fuel, but also on account of the entire absence of vibration at whatever speed the engines may be running. It has been found that the consumption of fuel is from 10 to 15 per cent. less with this type of engines than with ordinary triplex engines working at 160 lbs. pressure. The builders have several more sets of balanced engines in course of construction for steamers for various purposes, though this is the only steamer hitherto acquired by the Rickmers Co. which is fitted with them. The launch was witnessed by a goodly company of visitors, including Mrs. R. Spence Watson and the Misses Spence Watson, Mr. Charles J. and Miss Spence, Mr. and Mrs. F. W. Dendy, Mr. and Mrs. Christie, Mr. Wigham Richardson, Mr. J. Tweedy, Miss Dupre, Miss Roberts, Miss Moffat, Mr. Frank Richardson, Mr. Burland, Mr. and Mrs. Frank Christie, Mr. R. H. Winstanley, Mr. E. P. Sturge, Mr. G. Glover and Mr. A. Heine, of Bremen, under whose superintendence the steamer is being constructed. The christening ceremony was gracefully performed by Miss Mary Spence Watson, daughter of R. Spence Watson, of Bensham Grove.

Sigurd.—On Saturday, March 28th, Messrs. William Gray & Co., Limited, launched a fine steel screw steamer of the following dimensions, viz.:—Length, over all, 285 ft. breadth, 39 ft. 6 in.; depth, 19 ft. She has been built to the order of Mr. L. H. Carl, of Copenhagen, and will take Lloyd's highest class. The deck erections consist of poop, raised quarterdeck, and partial awning deck. A handsome saloon, state-room, and accommodation for captain and officers will be fitted up in the poop, and comfortable quarters for the engineers amidships, and for the crew forward. The hull is built with web frames and cellular double bottom, and with large ballast tank in the after peak. Four steam winches, large patent donkey boiler, steam steering gear placed in engine-room casing, hand screw steering gear aft, direct steam windlass, schooner rig, boats on beams overhead, grain divisions, and all improved appliances for working the steamer will be provided. The engines are of the triple-expansion type working on three cranks, and are from the Central Marine Engine Works of Messrs. William Gray & Co., Limited, the cylinders being 21 in., 33 in., and 56 in. diameter, with 36 in. piston stroke, and two large steel boilers to work at a pressure of 160 lbs. per square inch. The steamer has been superintended during construction by Captain C. A. Jorgensen, on behalf of the owner, and the ceremony of naming her *Sigurd* was gracefully performed by Miss Nielsen, of Hartlepool.

Portodi Scio.—On March 30th a wooden steam-tug, named the *Portodi Scio*, was launched at Falmouth. Owned by Messrs. Papayanni and Jeremias.

Midas.—On March 30th a steel barque, of 1,502 tons gross, named the *Midas*, was launched at Maryport, owned by Messrs. Ritson & Co.

Laurelwood.—On March 30th Messrs. Ropner & Son, of Stockton-on-Tees, launched a steel screw steamer of the following dimensions, viz.:—Length, between perpendiculars, 290 ft.; breadth, extreme, 43 ft.; moulded depth, 19 ft. 9 in., which they have built for Mr. Christian Klaveness, of Christiania. The vessel is built on the part-awning decked rule, with poop and raised quarterdeck, her deadweight carrying capacity being 3,500 tons on 18¾ ft. The saloon and cabins for captain and officers are fitted in the poop, the engineers' accommodation being amidships. She is built on the web frame principle, leaving the holds entirely clear for cargo, and carries her water ballast in a cellular bottom and in the after peak. All labour-saving appliances are fitted for the economical working of the steamer, and also for the expeditious loading and unloading of cargoes. She has steam steering gear amidship and screw gear aft, four powerful steam winches, a large multitubular donkey boiler, direct steam windlass, stockless anchors, &c. The engines will work up to about 900 effective H.P., and are by Messrs. Blair & Co., having cylinders 21½ in., 35½ in., and 58½ in. by 39 in. stroke, steam being supplied by two large steel boilers working at 160 lbs. pressure. The name of *Laurelwood* was given to her as she left the ways.

Clan Lindsay.—The Naval Construction and Armaments Co., Limited, have launched from their yard at Barrow the s.s. *Clan Lindsay*, built to the order of the Clan Line Steamers, Limited, Glasgow. This is the second to be launched of the sister ships placed with the builders, the first vessel, the s.s. *Clan Menzies*, having been delivered to the owners about a month ago. The vessel is of the following dimensions:—312 ft. between perpendiculars; 40 ft. moulded breadth; 26 ft. 2 in. depth, moulded; 2,600 tons gross tonnage.

Truma.—On March 31st Messrs. Short Brothers launched at Pallion, on the Wear, a steel screw steamer, built to the order of Mr. C. Boe, of Arendal, of the following dimensions:—Length, 255 ft.; breadth, 36 ft. 9 in.; and depth, moulded, 20 ft. 4 in., with a deadweight carrying capacity of about 2,550 tons. The vessel, which is to class 100 A1 at Lloyd's, and 1 A1 Det Norske Veritas, has been built for the general trade, and was named *Truma*. The vessel is fitted with triple-expansion engines and boilers by Messrs. Allan & Co., Limited, Sunderland, the cylinders being 19 in., 31 in. and 51 in. diameter, with a stroke of 36 in., the working pressure being 160 lbs. This vessel was built in the remarkably short period of 49 working days including Shrove Tuesday and March 17th, on both of which days the yard was idle; also counting Saturday a full day, and not allowing for lost time through bad weather, the first keel plate having been laid on February 1st.

St. Lawrence.—On April 1st an iron ketch-rigged steamer of 150 tons gross, named the *St. Lawrence*, was launched at Beverley. Owned by T. Hamling & Co., Limited. Port of registry, Hull.

Pontoon Dock.—On April 1st Messrs. Swan & Hunter launched from their yard at Wallsend the first half of the large pontoon dock they are building for the Smiths' Dock Co., of North Shields. This dock, which has been designed to lift vessels of a deadweight of 6,500 tons in a space of thirty minutes, is one of Messrs. Clark & Stanfield's well-known off-shore docks, and has been constructed from the designs of this firm. It will be remarkable for the great rapidity with which it will be able to deal with vessels of large tonnage, and also for the fact that electricity is being used as the motive power for the pumps, the current being supplied from the yard installation. The present pontoon will be the second one that the owners have put down, the first having been so successful from every point of view, and when completed, which will be very shortly, it will make this yard the most complete and most modern equipped ship-repairing establishment in the world. Messrs. Lindbergs, of Stockholm, are also fitting their yard with one of these off-shore docks, the first portion of which was launched from their yard on the 28th ult., they being in the present case their own constructors under the supervision of the patentees, Clark & Standfield. The lifting power of this dock will be a little over 2,000 tons, the motive power in this case being supplied by oil engines on the dock itself.

Spar Deck Steel Screw Steamer.—On Wednesday, April 1st, there was launched from the Cleveland Dockyard of Sir Raylton Dixon & Co., Middlesbrough, a spar-deck steel screw steamer, No. 422. Dimensions, 322 ft. by 40 ft. 6 in., by 28 ft., built to Lloyd's 100 A1 class, and with a deadweight capacity of about 4,650 tons. She is built on the deep frame system with five bulkheads and cellular double-bottom for water ballast. The spar deck is of iron, main deck of steel, and poop, bridge and forecastle decks of wood, with handsome accommodation under bridge for captain, officers, and engineers. The engines will be supplied by Messrs. Thos. Richardson & Sons, Limited, Hartlepool, the diameter of the cylinders being 23 in., 36 in., and 59 in. by 42-in. stroke, with two large steel boilers. This vessel is sister ship to the *On Sang* and *Ilaro*, lately built by the same builders.

Simonside.—On Monday, April 13th, Messrs. Wm. Gray & Co., Limited, launched a fine large steel screw steamer, which they have built to the order of Messrs. J. & E. Kish, of Sunderland. She will take Lloyd's highest class, and is of the following dimensions, viz.:—Length over all, 336 ft.; breadth, 47 ft.; depth, 24 ft. 10 in.; with a half poop, bridge over the machinery space, and a topgallant forecastle. A tasteful saloon and state-rooms, together with the captain's and officers' rooms, will be fitted under the poop. The hull is built with web frames, and double bottom under each hold for waterballast. Six steam winches, steam steering gear amidships and screw gear aft, patent direct steam windlass by Emerson Walker & Co., iron longitudinal grain division, stockless anchors, and a complete outfit will be fitted for a first-class cargo boat. Fine triple-expansion engines are being supplied by the Central Marine Engine Works of Messrs. William Gray & Co., Limited. They will develop over 1,200 H.P. The cylinders are 24 in., 38 in., and 64 in. diameter, with a piston stroke of 42 in. Steam will be supplied by three large main boilers, of steel, at a working pressure of 160 lbs. per square inch. This arrangement enables donkey boilers to be dispensed with, as any one of the main boilers can be kept under steam for working the winches, windlass, &c. The vessel has been constructed under the superintendence of Mr. M. Metcalfe on behalf of the owners, and the ceremony of christening her *Simonside* was gracefully performed by Miss Amy Forster, of Sunderland. Amongst those present at the launch were the Misses Forster, Sunderland, the Messrs. Kish, Mr. W. C. Gray, Mr. John Tulley, Mr. C. L. Cummings, and Mr. M. Metcalfe.

Haratio.—On Tuesday, April 14th, Messrs. Furness, Withy & Co., Limited, launched from their shipbuilding yard at Hartlepool, a large steel screw steamer, built to the order of Messrs. T. Wilson, Sons, & Co., Limited, Hull. She is a fine type of a modern cargo boat, measuring over 340 ft., in length, and built throughout of Siemens-Martin steel, with a large measurement and deadweight capacity, and built to the highest class at British Corporation, this being the third vessel built by Furness, Withy & Co. for Messrs. Wilson under this classification within the last twelve months. The vessel is built on the spar deck principle, with long bridge, poop, and topgallant forecastle. The holds are fitted with wood shifting boards, and all deck erections, skylights, bulwarks, bulkheads, &c., are constructed of steel and iron. Cellular double bottom, fitted all fore and aft for water ballast, the after peak being also available as a tank. The greater portion of the plates are in 24 ft. lengths, making the structure of the ship very strong. Six steam winches, patent steam steering-gear amidships, screw gear aft, direct steam patent windlass, stockless anchors, hauling into hawse-pipes, and other modern appliances are fitted for the handy working of the vessel. The saloon and cabin providing accommodation for the captain, &c., is handsomely finished in polished hardwood. The steamer will be rigged as a two-masted fore-and-aft schooner, and has been constructed under the supervision of Mr. J. T. Wilks. She will be fitted with three large boilers and triple-expansion engines of massive design by Messrs. Westgarth, English & Co., Middlesbrough, with every provision for economical working at a minimum cost of upkeep. The machinery has been built under the supervision of Mr. Spear, superintendent engineer for Messrs. Wilson. On leaving the ways she was gracefully christened *Haratio* by Mrs. H. Withy, Brantford House, West Hartlepool.

Norden.—On Tuesday, April 14th, Messrs. Richardson, Duck & Co. launched from their yard a steel screw steamer of the following dimensions, viz.:—Length over all, 320 ft.; breadth, 42 ft.; depth, 23 ft. 1 in.; gross tonnage, 2,400. This vessel, which has been built to the order of the Dampskibs Selskabet "Norden" (Mr. Peter Brown, manager), Copenhagen, will class 100 A1 at Lloyd's register, and has been built under special survey. She is of the single-deck type, having a cargo poop aft, bridge over engines and boilers, and containing accommodation for captain, officers, and engineers, and a topgallant forecastle for crew. A cellular double bottom for water ballast is fitted throughout, also fore and aft peak tanks, and the equipment includes large multitubular donkey boiler, five steam winches, steam windlass, stockless anchors, steam steering gear, double derricks, &c. The engines, by Messrs. Blair & Co., have cylinders 22½ in., 37 in., and 61 in. by 42 stroke, steam being supplied by two single-ended boilers, working at a pressure of 160 lbs. As the vessel was leaving the ways she was christened *Norden* by Mrs. Lockwood, of Stockton-on-Tees.

Steel Screw Steamer.—On Tuesday, April 14th, there was launched from the yard of the Sunderland Shipbuilding Co., Limited, a steel screw steamer, 210 ft. B.P. by 32 ft. breadth, by 16 ft. 6 in. depth, built to the highest class at Lloyd's under special survey, having raised quarterdeck, bridge, and topgallant forecastle. The engineers' mess-room and all accommodation for the captain and officers is placed amidships. The vessel is provided with steam winches and patent windlass by Messrs. Clarke, Chapman & Co., combined hand and steam steering gear by Messrs. Donkin & Co., and has large hatches to facilitate the loading and discharging of cargo; tri-compound engines by the North Eastern Marine Engineering Co., Limited, Wallsend-on-Tyne, having cylinders 16 in., 26 in., and 43 in. by 30 in. stroke, 160 lbs. pressure, which include all the latest improvements in marine engineering. The vessel is built with a view to carrying a large deck cargo and large internal capacity, and will carry a deadweight of 1,500 tons on 15 ft. 9 in. mean draught. During construction both hull and machinery have been inspected by Mr. Barclay on behalf of the owners, Messrs. Pile & Co., of London.

Netherfield.—On Tuesday afternoon, April 14th, there was launched from the shipbuilding yard of Messrs. Joseph L. Thompson & Sons, Limited, North Sands, a steel screw steamer built to the order of Messrs. Joseph Brown & Son, of Old Castle Buildings, Liverpool. The vessel is of about 4,850 tons deadweight capacity, and is constructed in accordance with Lloyd's rules for highest classification. The engines are of the triple-expansion type, by Messrs. John Dickinson & Sons, Limited. On leaving the ways the vessel was gracefully christened *Netherfield* by Miss Amina Brown, of Liverpool, daughter of Mr. Joseph Brown.

Wilhelmina.—On April 14th Messrs. Short Brothers launched at Pallion, Sunderland, a screw steamer, built to the order of Stoomvaart Maatschappy Noord Europa. The vessel is built of Siemens-Martin steel to the highest class in Lloyd's registry, and is of the following dimensions:—Length, 314 ft.; breadth, 43 ft.; depth moulded, 23 ft. 10 in.; with a deadweight carrying capacity of 4,100 tons. The vessel was named *Wilhelmina*, and will be fitted with triple-expansion engines by Messrs. Blair & Co., Limited, of Stockton-on-Tees, having cylinders 22¼ in., 37 in., and 61 in., with a stroke of 42 in., with steel boilers, having a working pressure of 180 lbs., and fitted with Howden's forced draught.

Esmeralda.—On April 14th the new cruiser, *Esmeralda*, built by Sir W. G. Armstrong & Co., for the Republic of Chili, was launched from the Elswick yard of the firm by Madame Uribe, wife of Admiral Uribe, Chief of the Chilian Naval Commission in Europe. The length of the vessel is 436 ft.; breadth, 53 ft. 2 in.; draught, 20 ft. 6 in.; displacement, 7,000 tons. The vessel is flush-decked, built entirely of steel, sheathed with wood, and coppered. The engines are designed to propel the vessel at a speed of 22¼ knots with natural draught. At the luncheon Lord Armstrong said that this was the fourth cruiser built for the Chilian Navy. The previous *Esmeralda* had been engaged in active warfare, and this was the second *Esmeralda* built by the firm for that navy.

Surf.—On April 15th Messrs. S. P. Austin & Son launched from the Wear Dockyard, Sunderland, the steel screw steamer *Surf*. Her dimensions are as follows:—Length, 255 ft.; breadth, 35 ft. 3 in.; depth, 19 ft. 7 in. moulded. Her machinery, which will be supplied by Messrs. J. Dickinson & Sons, Limited, will be of the tri-compound type, to indicate 900 H.P. The vessel has been constructed under special survey at Lloyd's to class 100 A1.

Almirante Simpson.—On April 15th Messrs. Laird Bros., of Birkenhead, launched a torpedo gunboat for the Chilian Navy, which was named *Almirante Simpson*. The dimensions are:—Length, 240 ft.; beam, 27 ft. 6 in.; depth, 16 ft.; with 800 tons displacement. The machinery consists of twin-screw triple-expansion engines 4,500 I.H.P. The boilers are of the Normand water-tube type, with a pressure of 200 lbs. The estimated speed is 21 knots. The range of action at 10 to 11 knots speed is about 4,000 knots.

Albertville.—On Thursday, April 16th, Sir Raylton Dixon & Co. launched from their Cleveland dockyard, Middlesbrough, the handsomely-modelled mail and passenger steamer *Albertville*, built to the order of Messrs. The African Steamship Co., London, for the Compagnie Belge Maritime du Congo, for the line between Antwerp and the West Coast of Africa. The dimensions of the vessel are:—Length, 365 ft.; beam, 44 ft.; depth, moulded, 26 ft. The cabin accommodation will be of very handsome description, fitted for 110 first-class and 60 second-class passengers, with very spacious state-rooms, specially ventilated and provided with every improvement which experience has suggested as suitable for the intended trade and the comfort of passengers in a hot climate. The first-class dining-room is in a large house on deck, panelled with marble and inlaid woods in the handsomest possible manner. The first-class smoking-room, second-class smoking-room and cabin entrances are all most elaborately fitted and decorated. The decks are all of teak, and over the amidship part of the vessel a teak shade deck extends to the sides of the ship, so as to give shelter from the sun and to form a promenade above for passengers. The second-class saloon is placed aft, handsomely panelled in teak, with tables, revolving chairs, &c. The ship will be lighted throughout with the electric light, and also provided with refrigerating machinery, and a large cooling chamber for the conveyance of fresh meat, provisions, &c. Machinery of 2,000 I.H.P. will be supplied by Messrs. Thomas Richardson & Sons, Limited, of Hartlepool, consisting of triple-expansion engines having cylinders 27 in., 43 in., and 72 in. by 48 in. stroke, with two large boilers working at 180 lbs. pressure and fitted with Howden's forced draught. The vessel was launched in the presence of Fredk. W. Bond, Esq., of London, the chairman of the African Steamship Co., and the christening ceremony was performed by Mrs. Bond. The *Albertville* is a similar vessel to the *Leopoldville*, built last year for the same line, but of larger dimensions and higher speed.

Loongmoon.—On April 17th Messrs. Wigham Richardson & Co. launched, at Newcastle-on-Tyne, a steel screw steamer which they have in course of construction for the Chinesische Kustenfahrt Gesellschaft, of Hamburg, being intended for their service in the East. The steamer is 310 ft. in length by 38½ ft. beam. She will be rigged as a two-masted schooner, and is being built to attain the highest class in the Registry of the Bureau Veritas and Germanischer Lloyd. The vessel has been specially constructed for the Chinese coasting trade. The engines and boilers are also being constructed by Messrs. Wigham Richardson & Co., the former being of the quadruple-expansion type. The vessel was named the *Loongmoon*.

LAUNCHES.—Scotch.

Sapucaia.—On March 12th Messrs. A. Rodger & Co., shipbuilders, Port-Glasgow, launched a steel twin-screw steamer for the Amazon Steam Navigation Co., Limited, London. The dimensions are:—Length, 170 ft.; breadth 28 ft.; depth, 10 ft. 6 in. The steamer is named *Sapucaia*, and is intended for the company's cargo trade. Triple-expansion engines will be supplied by Messrs. Hall-Brown, Buttery & Co., Glasgow.

Livramento.—On March 14th there was launched from the yard of Messrs. Ritchie, Graham & Milne, Whiteinch, Glasgow, the twin-screw steamer *Livramento*, built for the cattle trade on the Amazon. Her dimensions are as follows:—Length, 102 ft. 6 in.; breadth, 20 ft.; depth, 7 ft. Messrs. Hall-Brown, Buttery & Co., Govan, are supplying engines, which are of the compound surface-condensing type, with cylinders 9 in. and 18 in. diameter by 12 in. stroke, and a return tubular boiler of 120 lbs. working pressure.

Jattra.—On March 24th Messrs. Robert Duncan & Co., Limited, Port-Glasgow, launched from their shipbuilding yard a steel twin-screw steamer for passenger, towing, and merchandise service on the Hooghly at Calcutta and the surrounding districts. The dimensions are 156 ft. by 26 ft. by 11 ft., and the vessel is fitted with all the most modern appliances, such as steam capstans, steam steering gear, steam winches, stockless anchors, &c. A complete installation of electric lighting has also been fitted up. As the steamer has been designed for a high rate of speed, to attain this Messrs. Rankin & Blackmore, Greenock, are to supply two sets of Rankin's patent disconnecting twin-screw triple-expansion engines. The vessel has been built to the order of Messrs. Duncan M'Neill & Co., of London and Calcutta, and will be commanded by Captain M'Phail, who has just arrived from the latter place with a native crew. As the vessel left the ways she was named *Jattra* by Miss Minnie Stark, of Greenock, and was afterwards towed to Greenock to receive her machinery. The hull and machinery have been constructed under the supervision of Mr. Robert Morton, 21, Bothwell Street, Glasgow.

Ymer.—On March 26th Messrs. Russell & Co., Port-Glasgow, launched from Kingston yard a steel-screw spar-deck steamer of 3,460 tons register, to carry 5,450 tons deadweight on a 23 ft. draught, to the order of Messrs. Wicander, Stockholm. Dimensions:—Length, 340 ft.; breadth, 43 ft.; depth, 29 ft. Triple-expansion engines will be supplied by Messrs. Fleming & Ferguson, Paisley, of 25 in., 40 in., and 64 in. by 42 in. stroke. The steamer is named *Ymer*.

Eller.—On March 27th Messrs. John Fullerton & Co. launched, from Merksworth Building Yard, a steel-screw steamer of 240 tons deadweight, which has been built to the order of Mr. Robert Simpson, Whitehaven, for his coasting trade. Compound engines of 45 N.H.P. will be supplied by Messrs. Ross & Duncan, Whitefield Works, Govan. As the vessel left the ways she was named the *Eller* by Mrs. James Kennedy, 25, Elmbank Street, Glasgow.

Fairport.—On March 27th Messrs. Russell & Co., shipbuilders, Port-Glasgow, launched a three-masted steel sailing ship named *Fairport*, of 1,840 tons register, to carry 3,300 tons deadweight. The dimensions are:—Length, 266 ft.; breadth, 40 ft.; depth, 23 ft. 6 in. This vessel was built under the superintendence of Captain Summers to the order of Messrs. David Corsar & Sons, Arbroath.

Steam Hopper Barge.—On Friday, March 27th, Messrs. Wm. Simons & Co., Limited, launched a steam hopper barge "No. 5," of 570 tons capacity, constructed to the order of the British Government. Its dimensions are as follows:—Length, 155 ft. by 28 ft. 6 in. by 12 ft. 6 in.

Agnes.—On March 28th a steel schooner-rigged steamer, of 124 tons gross, named the *Agnes*, was launched at Aberdeen, owned by Mr. G. M. Chalmers.

Continente.—On March 30th there was launched from the yard of Messrs. Murdoch & Murray, Port-Glasgow, a finely-modelled steel twin-screw steamer of the following dimensions:—225 ft. by 32 ft. 6 in. by 18 ft. 8 in. The vessel is intended for service on the South American coast. The first-class saloon and state-rooms are placed forward of the machinery, where no vibration or noise will disturb the passengers; and opening out of the saloon is a large and airy smoke-room on the promenade deck, which extends right fore and aft, except in the way of the hatches. The second-class passengers are accommodated in a deck-house aft. The lower deck is fitted throughout for carrying cattle, with access through six watertight doors in the ship's side. The whole of this space can be converted in a short time so that emigrants may be carried. As the vessel left the ways she was christened *Continente* by Miss Edmondson, of Liverpool, and was immediately taken in tow for Glasgow, where Messrs. Lees, Anderson & Co. will fit on board two sets of powerful triple-expansion engines, which will drive the vessel at a high speed. During constructing the ship and engines have been under the supervision of Mr. R. Patchett, Birkenhead.

Daniel Erno.—On March 31st there was launched from the Camperdown Shipyard, Dundee, a steel screw steamer named the *Daniel Erno*, which has been built to the order of an Austrian shipowner. The vessel, which is of 650 tons burthen, has been constructed to the highest class at Lloyd's. Her dimensions are:—Length, 210 ft.; breadth, 28 ft. 6 in.; depth, 13 ft. The *Daniel Erno* will be engaged in general passenger and cargo traffic between Fiume and other Austrian ports.

Baron Innerdale.—On April 2nd Messrs. A. Rodger & Co. launched at Port-Glasgow a steel-screw steamer of 3,340 tons gross register, as an addition to the Baron Line of Mr. Hugh Hogarth, of Glasgow and Ardrossan. The steamer measures:—Length, 335 ft.; breadth, 43 ft. 6 in.; depth, 28 ft. 9 in. This steamer, which is the largest ever built in the yard of Messrs. A. Rodger & Co., was superintended during construction by Captain O. L. Murphy, and will be commanded by Captain Wisnom. She was named *Baron Innerdale*. Triple-expansion engines will be supplied by Messrs. Dunsmuir & Jackson.

Virgil.—On April 2nd Messrs. David and William Henderson & Co. launched, from their shipbuilding yard at Partick, the steel screw steamer *Virgil*, which they have built to the order of Messrs. Lamport & Holt, of Liverpool. The vessel has been built to the 100 A1 spar-deck class in Lloyd's Registry, and is of the following dimensions:—Length, 350 ft.; beam, 45 ft. 6 in.: depth, 27 ft.; with a gross tonnage of about 3,350 tons. She has been designed with a view of combining large carrying capacity with a fair speed. The vessel is built on the web-frame system. Water ballast will be carried in a double bottom and peaks. There are two complete decks, the weather-deck being of iron. The erections consist of a poop, long bridge, and topgallant forecastle. The saloon, captain's, officers', and engineers' accommodation are under the bridge-deck. The saloon is tastefully decorated and finished in polished hardwoods, and all the rooms are of large size. On the bridge-deck is a companion-house and chart-room, and on the top of this a teak wheel-house and navigating-bridge. The crew and petty officers are berthed forward in the topgallant forecastle. The hatches are of large size, and the arrangements for the expeditious working of the cargo are most complete, including five large steam winches and double derricks. The hull has been built under the personal supervision of Mr. John Russell, the owners' superintendent. A complete installation of electric light will be fitted by Messrs. W. C. Martin & Co., Glasgow. The machinery will be fitted by the builders, and consists of a set of triple-expansion engines with cylinders 26 in., 43 in., and 71 in., by 48 in. stroke, and two large single-ended boilers constructed for working pressure of 180 lbs., and fitted with Howden's system of forced draught. The machinery has been constructed under the supervision of Mr. Morran, the owners' superintendent engineer. As the vessel left the ways she was gracefully named by Mrs. Arthur Cook, Aigwith Hall, Liverpool.

Brilliant Star.—On April 8th a steel schooner-rigged steamer of about 124 tons, named the *Brilliant Star*, was launched at Aberdeen; owned by Mr. T. Walker, Aberdeen.

Germaine.—On April 8th a steam yawl-rigged steamer of 160 tons gross, named the *Germaine*, was launched at Glasgow; owned by Mr. A. Manceau; port of registry, Ostend.

Ibadan.—On April 9th Messrs. David J. Dunlop & Co., Inch Works, Port-Glasgow, have recently launched the steel twin-screw steamer *Ibadan*, built to the order of the African Steamship Co., of London, for their branch service on the West Coast of Africa, and immediately thereafter was moored alongside the yard wharf to receive her machinery, &c., consisting of two sets of triple-expansion engines of the latest and most modern design. The *Ibadan* is a duplicate of a steamer built and engined by Messrs. Dunlop, also for light draught service, her dimensions being:—Length, 204 ft.; beam, 35 ft.; and moulded depth, 13 ft.; the gross tonnage being about 800 tons. All arrangements for easily maintaining steam in the tropics are being fitted. The steam steering gear is Harrison's patent, the engine being placed in the engine-room directly under the control of the engineers. The deck machinery includes direct steam windlass and five steam winches, all of Messrs. Clarke, Chapman & Co.'s make, with their derricks. The poop, bridge, and forecastle, which are arranged to give exceptionally good light and ventilation, are fitted with cabins and saloons for officers, engineers, &c., the crew and firemen being located under the forecastle. The captain's cabin is fitted on the bridge deck in a large teak deckhouse. From this bridge the steamer is navigated. Awnings over the entire length of the vessel are provided, those over the poop and steam winches being fitted of steel framing, with canvas-covered, tongued and grooved planking. The rig is that of a two-masted fore-and-aft schooner. It is expected the *Ibadan* will be ready for sea in about a fortnight.

Talisman.—On April 13th Messrs. A. & J. Inglis launched a paddle-wheel steamer for the North British Steam-Packet Co., for their trade between Craigendoran and Rothesay. The steamer is to be handsomely fitted up for the accommodation of passengers. As the vessel left the ways she was named *Talisman* by Miss Grierson, Craigend Park, Edinburgh.

Dona Catalina.—On April 13th Messrs. John Fullerton & Co. launched, at Paisley, a steel tug steamer of about 200 tons gross measurement, which has been built to the order of a South American firm for towing purposes in that country. The steamer is to be fitted with powerful compound engines by Messrs. Ross & Duncan, Govan, and is equipped with steam steering gear and steam windlass by Reid & Sons, of Paisley, and all other requisites for a steamer of her class. As she left the ways the steamer was named *Dona Catalina* by Miss Jolly, Greenhead House, Govan.

St. Elvies.—On April 13th there was launched, from the Fairfield yard, the paddle steamer *St. Elvies*, for the service of the Liverpool & North Wales Steamship Co., Limited. The vessel is 250 ft. long, 28 ft. 3 in. beam, and 18 ft. 3 in. depth moulded to upper deck, and has a gross tonnage of about 700 tons. She will be fitted with compound diagonal surface condensing engines, cylinders 37 in. and 72 in. diameter, with 5 ft. stroke. The *St. Elvies* is designed to join the *St. Tudno*, built at Fairfield about five years ago, in the pleasure service between Liverpool, Llandudno, and Menai Straits. The naming ceremony was performed by Mrs. Elgar, wife of Dr. Elgar. Lunch was provided after the successful floating of the vessel, at which Dr. Elgar proposed the toast of the Liverpool and North Wales Steamship Co., and Mr. Charles T. Kamsey, of Liverpool, representing the company, responded. Sir Donald Currie gave the health of the lady who christened the boat, and Mrs. Elgar gracefully acknowledged the toast in her own behalf.

Dunvegan Castle.—On April 14th there was launched from the yard of the Fairfield Shipbuilding & Engineering Co., Limited, Govan, the royal mail steamer *Dunvegan Castle*, which has been built for the Castle Mail Packet Co., Limited. The vessel is the eighth which has been constructed at Fairfield for the same owners. Her gross tonnage is about 6,000 tons, and her dimensions are:—Length, 465 ft.; breadth, 51 ft.; and depth, 35 ft. The vessel will be rigged—like the *Tantallon Castle*—with three masts, having yards on the foremast. The hull is built of steel throughout, under special survey, to class 100 A1 at Lloyd's, with additional strengthening introduced. She has a cellular double bottom fore and aft, arranged for carrying water ballast, and is subdivided into separate compartments by 10 watertight bulkheads. She has a very long topgallant forecastle, a promenade bridge and poop, with deck-houses and navigating-bridge above. Accommodation is provided—in addition to that for the ship's complement, numbering some 187 persons—for about 280 first-class, 100 second-class, and 80 third-class passengers. Arrangements have been made for the extension of the third-class accommodation when required. The first and second-class cabins are arranged on the main and upper decks, with a few state-rooms in the bridge-house. They are extremely capacious, and will be fitted with the most modern comforts and conveniences. Some of the first-class state-rooms are arranged and fitted so as to communicate with each other, and form sitting and bed rooms *en suite* if required. The first-class dining-saloon, situated on the main deck, is a large room about 50 ft. square. It will have ample seating capacity for the passengers carried. All the framing and panelling of the saloon will be in wainscot oak, with furniture to match, the design being in the Tudor style. The saloon will be of hardwood, enamelled white and richly decorated. The first-class smoking-room is situated on the bridge deck, and is specially designed with a view to airiness, being built with a domed roof of unusual height, and having a skylight on the roof and square opening windows all round. The panelling will be of oak, specially designed. The drawing-room is situated on the promenade deck, adjoining the principal saloon entrance. The interior of this room will be designed in the Chippendale style, fittings and furniture being of dark mahogany inlaid with satin wood. The upholstery will be of the most elegant and luxurious character. The second-class saloon is in the forward part of the vessel, and is also a very spacious apartment, extending the full breadth of the vessel. This room will be panelled in teak and sycamore. The second-class smoking-room is on the upper deck at the fore-end of the bridge, and is specially well-lighted and ventilated. The third-class passengers are berthed forward on the main and lower decks, in large cabins, arranged to accommodate four and six persons in each. The dining-saloons are comfortably fitted in polished hardwood. All the third-class cabins will be fitted with spring wire mattresses, patent lavatories, &c., and third-class passengers by the *Dunvegan Castle* will enjoy a large degree of comfort and privacy. Separate galleys are provided for the different classes of passengers, and adjoining each dining-saloon is a pantry fitted with steam carving tables, hot presses, and all the most improved appliances for ensuring a perfect service. Electric cabin bells will be fitted to all the cabins, saloons, &c., connecting with the stewards' department. A refrigerating plant is fitted on board, and properly insulated cold chambers are being provided for the conveyance of both fresh meat and fruit. A complete outfit of boats and life-saving appliances and all other details required by the Board of Trade are provided. The vessel will be fitted with seven steam winches for the speedy handling of cargo at the Cape ports, and with a complete outfit of steam windlass and warping capstans by Napier Brothers, Limited, Glasgow. She will be steered by means of a steam tiller aft and telemotor gear communicating with the navigating bridge. A hand steering gear is also provided. The *Dunvegan Castle* will be fitted with triple-expansion engines, having three cylinders working on three cranks. These engines have been designed and constructed with a view to obtaining the best possible results with the least consumption of coal, and to this end all the newest improvements resulting from long experience have been introduced. The high-pressure cylinder is fitted with a piston valve, and the intermediate and low-pressure cylinders each with a double-ported slide valve, all of which are worked with double eccentrics and link-motion gear. The shafting throughout is of ingot steel, the propeller blades, four in number, being of manganese bronze. The boilers for generating steam are five in number, all of the return multitubular marine type, three being double-ended and two single-ended, with one large funnel. Each of the double-ended boilers has six and each of the single-ended four furnaces, making a total of 26 furnaces. The boilers are constructed entirely of steel, and adapted for a working pressure of 170 lbs. per square inch. Fans driven by single-acting triple-expansion engines are fitted to the stokeholes for improving the ventilation and for maintaining an ample supply of air in the tropics, while the stokehole is fitted with "See's" patent ash ejector. In arranging the machinery on board this vessel everything has been done to facilitate the working of the ship and the accessibility of her various parts. A most complete water-service arrangement is fitted throughout the ship, with separate donkey pumps for hot and cold water, all specially adapted for the service for which she is intended. The vessel is lighted throughout by electricity, and the necessary current is supplied by three "Siemen's" dynamos, each driven direct by compound engines. The christening ceremony was performed by Mrs. Mirrlees, daughter of Sir Donald Currie.

India.—On Wednesday, April 15th, the largest vessel yet built at Greenock was launched from the shipbuilding yard of Messrs. Caird & Co., for the Peninsular and Oriental Steam Navigation Co. This was the steel screw steamer *India*, a vessel 500 ft. in length, 54 ft. in breadth, and 37 ft. 6 in. depth, and of 8,000 tons register. The *India* when completely finished will be a veritable floating palace. She is strongly constructed and modelled on beautiful lines. The builders will furnish her with triple-expansion engines of 11,000 H.P., having four cylinders and four cranks, and capable of propelling the vessel at a high rate of speed. The engine-rooom is replete with all modern appliances. The boilers are fitted with Howden's patent system of forced draught, the shafting throughout is of Vickers' steel, and the propeller blades are of manganese bronze. The deck machinery embraces all the most approved facilities, and in this connection it may be stated that the cargo gearing is all hydraulic, and practically noiseless in its working. Built in accordance with Lloyd's 100 A1 class, the *India* is a magnificent specimen of marine architecture, and will form a splendid addition to the company's fleet. She will carry 500 saloon passengers, for whose comfort every requisite has been provided. The saloons have been designed by Mr. T. E. Collcutt, the architect of the Imperial Institute; while the beautiful wood panelling, &c., in the saloons, music-rooms, smoking-room, library, &c., have, it is worthy of note, been designed and executed in Messrs. Caird & Co.'s establishment. The ceilings will show rich plaster work, and all the apartments will be furnished and upholstered in the highest style. The state-rooms, the greater number of which are on the main deck, are particularly large and roomy, and are arranged with one, two, or three berths, so that intending passengers can have ample choice. Some of the apartments are made to communicate, so that they can be used very conveniently as family rooms. Those on the promenade deck are nearly all single berth cabins. In each apartment there is a patent lavatory, a whatnot, nettings, mirrors, and a chest of drawers, the latter being arranged in such a manner that it can be used as a writing table. There are a large number of solid marble baths, and in addition there are several rooms fitted up with appliances for douche, spray, and other baths. Particular attention has been paid to the ventilation of all the apartments, and ample sanitary accommodation is provided; the ship is lighted with a complete installation of electricity, and a large refrigerating chamber has been provided. She carries a full complement of boats and life-saving appliances. Accommodation of a first-class kind is provided for both officers and crew. The steamer has been constructed under the superintendence of Mr. H. J. Taylor, and the engines under Mr. John Pettigrew, with assistants. With the launch of the *India*, and with the completion of the vessels now under construction for the P. & O. Co., this great shipping concern, which admittedly stands at the head of all similar enterprises, will have a magnificent fleet of 64 steamers, representing over 300,000 tons, with which to carry on their extensive operations. The firm of Messrs. Caird & Co. have, during the period referred to, been entrusted with the building of no fewer than 46 steamers, representing over 200,000 tons of shipping, for the P. & O. Co. The latest addition to the P. & O. fleet was launched at half-past 12 o'clock, the ceremony of naming her the *India* being performed by Miss Mary Anne Kendall, daughter of Mr. Kendall, one of the directors of the P. & O. Co.

Mount Sephar.—On April 15th Messrs. Barclay, Curle & Co. Limited, launched from their building yard, Clydeholm, Glasgow, the steel screw steamer *Mount Sephar*, built to the order of Messrs. Smith & Service, Glasgow, and intended to trade between the United Kingdom and the East Indies. The vessel has been constructed under British Corporation rules and to class in Lloyd's registry 100 A1; is rigged as a fore-and-aft schooner with telescopic masts, and will be fitted and finished with all the latest modern appliances for efficiency in handling ship and cargo. The vessel has been built under the personal supervision of Captain Ellicott, who takes the command; and the machinery department was under the superintendence of Mr. Reid. The dimensions are:—350 ft. by 45 ft. by 28¼ ft., and measures about 3,650 tons gross, and will carry about 6,000 tons deadweight. The naming ceremony was performed by Mrs. Andrew Maclean, jun., of Ardgour, Balshagray Avenue. After the launch the vessel was towed to the harbour to receive her machinery, which is being supplied by the builders' firm, with a steam-power development of 1,800 horses.

Countess.—On April 15th Messrs. Mackie & Thomson launched from their yard at Govan the steel screw steamer *Countess*, which they have built for Messrs. William Adam, Burghead. Her principal dimensions are:—Length, 178 ft.; breadth, 27 ft.; and depth, 13 ft. The engines, which are to be supplied by Messrs. Muir & Houston, will be triple-expansion, with cylinders of 17 in., 27 in., and 43 in. respectively, and a 37 in. stroke. Miss Agnes Low, Cardiff, christened the vessel.

Speedy.—On April 15th Messrs. Ramage & Ferguson, Limited, launched from their shipbuilding yard at Leith a twin-screw steel steam yacht of novel design, built to the order of Baron Barreto, Brandon Park, Suffolk. With a tonnage of about 250 tons Y.M., the new vessel, which has a straight stem projecting on the water-line forward and elliptical stern, is of the following dimensions:—Length, between perpendiculars, 115 ft., breadth, 20 ft. 6 in., depth, moulded, 12 ft., with a shade deck above extending the whole length of the vessel, and covering the owner's quarters, main saloon, &c., beneath. These cabins on deck, which are very spacious, comprise the owner's state-room and sitting-room forward, fitted up in rosewood, tinted hardwood and oak, while aft is the main saloon similarly furnished. State-rooms are provided below aft for a number of guests, and the 'tween decks forward are utilised for owner's dressing-room, bathroom, dark-room for photography, &c. The machinery has been specially designed to meet the Baron's requirements, and consists of two sets of triple-expansion engines 10 in., 16 in., and 26 in. by 18 in. stroke, driving bronze propellers, and taking steam from two large water-tube boilers made by Fleming & Ferguson, of Paisley, and suitable for a working pressure of 200 lbs. The starting and reversing levers for both sets are grouped together at forward end of engines, the reversing being accomplished by a direct steam gear of special design. The pumps are all independent, the feed pumps being connected to the owner's patent feed heater and automatic control. Electric lighting throughout the ship is supplied by Messrs. Claud Hamilton, Limited, of Glasgow, the driving engine being an original design of a two-crank single-acting compound engine, made by Laurence Scott & Co., of Norwich, which also supplies a powerful searchlight of 25,000 candle power. Among other appliances are a steam warping windlass forward, and steam capstan aft, which is specially arranged to hoist the steam launch on board. She is also fitted with an ash conveyor, for which a patent has recently been taken out by the owner. The vessel will have every modern appliance, and when finished will be one of the most complete of her class afloat. Punctually at 2.30 p.m. the vessel left the ways, the naming ceremony being performed by the Baroness Barreto in the presence of a distinguished company. The builders afterwards entertained the invited guests in their offices, where the toasts, usual on such occasions, were duly honoured.

Alerto.—On April 17th Messrs. John Fullerton & Co. launched a steel screw steamer, which has been built for towing purposes in South American waters. Compound engines will be supplied by Messrs. David Rowan & Sons, Glasgow. The dog shores were cut by Master Fullerton, and the steamer was named *Alerto* by Miss Fullerton, Abbotsburn, Paisley.

Giang Seng.—On April 18th Messrs. John Scott & Co. launched from their yard the screw-steamer *Giang Seng*, which they have built for a Chinese gentleman in Singapore. The dimensions are:—Length, 240 ft.; breadth, 34 ft.; and depth to main deck, 17 ft. 6 in. The builders have also supplied and fitted the triple-expansion engines of 160 N.H.P., with two large boilers having a working pressure of 170 lbs. The vessel has been built for the coasting trade round Singapore. She will carry 1,500 tons of cargo, and steam 11 to 12 knots per hour. She has a Board of Trade passenger certificate, and can accommodate 20 first-class passengers above awning deck, 30 second-class passengers in the po[illegible], and she has also third-class accommodation abaft forecastle. The vessel has two teak decks, and has very ample accommodation for the captain, officers, and crew; and the vessel has been fitted and finished under the superintendence of Captain Follet, who has had a long and successful experience in the trade for which the vessel is intended. The launching ceremony was performed by Miss Follet, of Liverpool. The vessel, as usual, was launched with steam up, and on leaving the ways immediately left for Burntisland, where she will load a cargo of coals for Singapore.

LAUNCH.—German.

Quarta.—On April 9th a steel screw steamer was launched from the yard of the Flensburg Shipbuilding Co. She has been built for the Steamship Co. of 1869, in Flensburg. Her dimensions are—272 ft. by 38 ft. 2 in. by 23 ft. 4½ in.; first-class German Lloyd's. The engines, 900 H.P., are being constructed by the Flensburg Shipbuilding Co.

TRIAL TRIPS.

Balmoral.—The last week of March the new steamer *Balmoral*, built by Messrs. C. S. Swan & Hunter, Limited, Wallsend-on-Tyne, for Messrs. Raeburn & Verel, of Glasgow, was taken to sea for her trial trip. The *Balmoral* is a finely modelled high-powered spar-decked steamer 380 ft. long overall, by 46 ft. beam by 30 ft. 3 in. moulded depth, and has been constructed with a long poop, long bridge amidships, and top-gallant forecastle, giving her a large cubic capacity for Eastern trades. She has been fitted with all the latest ideas for the rapid handling of cargo, and for the convenience of trading in different ports is sub-divided, not only with the usual bulkheads, but also with extra high 'tween decks. The machinery has been constructed by Messrs. George Clark, Limited, of Sunderland, and consists of a set of engines 26 in., 42 in., and 69 in. diameter by 48 in. stroke, supplied with steam by two large single-ended boilers fitted with Howden's system of forced draught; and in order to meet the requirements of various ports the hull and engines and boilers have been constructed, not only to pass Lloyd's survey, but also those of the British Corporation, Board of Trade, and the German law. The weather being somewhat stormy and thick, it was impossible to run the measured mile. The steamer, therefore, headed direct for Middlesbrough, and steamed to her destination at a mean rate of about 12½ knots, and was moored safely at the Redcar Wharf, where she took in part of her cargo of pig-iron, proceeding afterwards to Middlesbrough Docks for bunkers, after which she steamed over to Antwerp to complete her loading for Japan, the vessel having been chartered by the owners to the Nippon Yusen Kabushiki, Kwaisha Tokio, Japan, for their line of steamers between Europe and Japan. At the trial trip the managing owners were represented by Mr. William Raeburn and Mr. William Thomson, the superintendent; the builders by Mr. Rowland Hodge, and the engine builders by Mr. John Clark. In the course of a few remarks which were made after luncheon, Mr. Raeburn took the opportunity of observing that he had in recent years been carefully considering the question relating to the model and power of what are usually known as "tramp steamers," and he had come to the conclusion that, in order to compete successfully with other firms, it was necessary to have vessels which should not be too full, and should not be too slow, and with this object in view all their recent steamers, such as the *Osborne*, *Linlithgow*, and in the present case, the *Balmoral*, had been built on fine lines and with good power, so that, if necessary, the steamers could be propelled economically at a fair rate of speed, and thus be in a position to obtain the top freights which were available.

Islander.—On Thursday, March 26th, the s s. *Islander*, built by Messrs. Robert Thompson & Sons, Southwick, Sunderland, to the order of Messrs. Mark Whitwell & Sons, Bristol, went on her trial trip. The *Islander* is a ship of about 830 tons displacement, 150 ft. long, 24 ft. beam, and about 10 ft. 11 in. draught, intended for Messrs. Whitwell's Bristol and Jersey trade. Considerable interest attaches to this ship, as being the first engined by the new firm of Jameson & MacColl, of the Wreath Quay Engineering Works, Sunderland. The engines are of th compound surface-condensing type, having cylinders 19in.,nde

40 in. diameter, by 27 in. stroke, and steam is supplied by one cylindrical multitubular boiler 12 ft. 6 in. diameter by 10 ft. long, working at 120 lbs. pressure, also constructed by Messrs. Jameson & MacColl. It is to the credit of the new firm and their staff that the engines worked for several hours at about 88 revolutions per minute without a drop of water being put on any of the bearings, and without signs of heating being apparent anywhere.

Lorle.—On Thursday, March 26th, the new steel-screw steamer *Lorle*, recently launched by Messrs. Irvine & Co., of West Hartlepool, proceeded on her trial trip. She is the fourth vessel built by this firm for Messrs. Trechmann Brothers, of West Hartlepool. A large party were on board, amongst whom were Messrs. Otto Trechmann & Albert Trechmann, who represented the owners; Capt. Ben Murrell, and Mr. Maddison, who superintended the building of hull and machinery; Messrs. R. Coulson and E. F. Irvine representing the builders, and Mr. Corking the engine builders. Her dimensions are 314 ft. by 44 ft., by 23 ft. 3 in., with a gross tonnage of 2,685 tons, and has been built to Lloyd's highest class. Her deck erections consist of poop bridge and top-gallant forecastle. The saloon and cabins for captain and officers are fitted up in poop, engineers being berthed under bridge-deck at sides of engine room, and crew in top-gallant forecastle. A cellular double bottom extends fore and aft for water ballast. In order to provide for rapid loading and discharging, four powerful steam winches, by Irvine & Co., have been placed at hatchways, with double derricks to suit. Steam steering gear amidship, screw gear aft, two large donkey boilers, and direct steam windlass. Boats are placed on beams overhead. Triple-expansion engines by Messrs. Blair & Co., Stockton-on-Tees, have been fitted. Cylinders 23 in., 37½ in., and 61½ in. by 39 in. stroke. After cruising about for some time adjusting compasses, the vessel's speed was tested, when an average of 12 knots was obtained. The vessel then proceeded to Cardiff, under the command of Capt. Grahl, to load for her maiden voyage.

Selma.—On March 27th the largest turret steamer yet built left the Wear for her trial trip. She is the s.s. *Selma*, built for Messrs. George Horsley & Son, of Hartlepool, by Messrs. William Doxford & Sons, Limited, Pallion, and has a deadweight capacity of rather over 5,600 tons. After adjusting compasses the vessel was put on the measured mile, when a mean speed of 10·6 knots was attained. This makes somewhat of a record as a week's work for Pallion, as, taken together with the s.s. *Algoa*, which sailed on Tuesday, March 24th, the deadweight capacity of the two vessels amounts to rather over 17,000 tons, the *Algoa* being about 11,400 tons.

Rosefield.—The *Rosefield*, a large steel screw steamer, recently launched by Messrs. John Priestman & Co., at Southwick, left the Wear in the last week in March for her trial trip. The vessel, which is owned by Mr. F. Woods, of London, is 336 ft. long: 47 ft. broad; and her moulded depth is 24 ft. 10 in., and she has been built to the highest class at Lloyd's. The engines are of the triple-expansion type, and have been constructed by Messrs. Blair & Co., Stockton-on-Tees, with cylinders 24 in., 40 in., and 66 in. by 45-in. stroke, with two large boilers of the single-ended type, designed for a working pressure of 160 lbs. per square inch. In the run to the Tyne the engines worked with perfect smoothness, and, together with the ship, gave every satisfaction.

Bangalore. — A new twin-screw steamer, built by the Flensburg Shipbuilding Co., for the Hamburg-Calcutta line, went, on March 31st, on first trial trip. Her dimensions are 420 ft. by 50 ft. by 33 ft., and will load 7,500 tons. She has two engines on the triple-expansion system, each 900 H.P. On the trial the average speed was 12 knots. On leaving the port the starboard engine worked ahead and the port engine astern. The ship turned easily round her own axis against a very heavy easterly wind.

Fitzpatric.—On Tuesday, March 31st, the large new steel screw steamer *Fitzpatric*, built by the Tyne Iron Shipbuilding Co., Willington Quay, to the order of Messrs. Burrell & Son, of Glasgow, was taken to sea off the mouth of the Tyne for her official trial trip. The vessel is a very fine type of cargo steamer, having a deadweight carrying capacity of nearly 7,000 tons, and her dimensions are 365 ft. by 47 ft. by 29 ft. 9 in. moulded. She is fitted throughout with the most modern appliances for the economical working of ship and cargo. The propelling machinery, which has been constructed by the North-Eastern Marine Engineering Co., at the Wallsend works, consists of triple-expansion engines having cylinders 27 in., 43 in., 72 in., by 45 in. stroke, with two large multitubular steel boilers suitable for a working pressure of 170 lbs. per square inch. The working of the machinery throughout the trial gave the most satisfactory results. Mr. Stewart, who has superintended the construction of ship and engines, expressed his entire satisfaction with both vessel and machinery. After the trial the vessel proceeded to Cardiff to load for Bombay. This is the fifth vessel the Tyne Iron Shipbuilding Co. have recently built for Messrs. Burrell & Son, three of which vessels have been engined by the North-Eastern Marine Engineering Co., at Wallsend. The shipbuilders were represented by Mr. Bone, managing-director, and the engine builders by Mr. S. Hunter.

Culzean Castle.—On April 1st this splendid new saloon steamer, belonging to the Glasgow, Ayrshire and Campbeltown Steamboat Co., Limited, went down the river for a trial spin, after having been thoroughly overhauled during the winter. The steamer has had her boilers re-tubed and every part of her machinery examined, and a number of important alterations have been made on her by way of improving her accommodation, &c. Her length is 254 ft. and her beam 28½ ft. She has a continuous promenade deck from stem to stern, the aftermast has been removed, and new boats and deck seats of an improved type have been placed on board. The engine-room has been opened up and greatly improved. New steam steering gear has also been fitted. The saloons have been handsomely upholstered anew with maquette, and entirely redecorated. The large dining-saloon is capable of accommodating 100 persons at a time. There are postal and telegraph offices on board. The vessel is lighted throughout with electric light, and a notable addition to the installation has been made by placing three powerful lights on the deck-house in positions suitable for lighting the gangways and paddle-boxes. On May 1st, the Spring Holiday, the steamer goes on a special excursion to Campbeltown, leaving Glasgow Bridge Wharf at 7.30 a.m., and allowing passengers about five hours on land at Arran and three hours at Campbeltown. It is also intended to make special excursions to Campbeltown on the Greenock and Paisley Spring Holidays. The steamer will resume her sailings for the season on 18th May.

Iolaire.—The new steam yacht *Iolaire*, 720 tons Y.M., having completed her final trials on the Firth of Forth, sailed from Leith for Oban on April 5th. Before leaving an opportunity was afforded local yachtsmen of inspecting her, and much interest was taken in the various novelties and improvements pointed out to them. The main saloon, the fittings of which have been designed by Messrs. Dunn & Watson, architects, and executed by Messrs. Cubitt & Co., of London, was specially admired, its combination of satinwood and richly-figured mahogany, upholstered in artistic Lyons tapestry, being most striking. The owners' quarters also attracted a good deal of attention, the arrangement of sitting-room, double stateroom, and dressing-room *en suite* giving accommodation rarely seen in any yacht. All the forepart of the ship is taken up with the saloon and owners' and guests' staterooms; while, in addition, a smoking-room aft, fitted up in polished oak, with several additional berths, can be used when necessary. Teak decks throughout have been fitted, and as regards fittings a very complete installation of electric lighting by Messrs. Siemens, a telemotor hydraulic steering gear, refrigerating chamber, and ice-making machinery, may be specially mentioned. The *Iolaire*, which is now the flagship of the Royal Forth Yacht Club, was launched about two months ago by Messrs. Ramage & Ferguson, Limited, for Sir Donald Currie, K.C.M.G., M.P.

Glenlochy.—On April 8th the trial trip of the *Glenlochy*, a steel screw steamer of 4,650 tons, built by the London and Glasgow Engineering and Iron Shipbuilding Co., Limited, for Messrs. M'Gregor, Gow & Co., London, for their China and Japan trade, took place on the Clyde. The vessel is 400 ft. long, 49 ft. broad, and 29 ft. deep, and carries 7,050 tons at load draught. The engines are of the triple-expansion type, with cylinders of 29 in., 47 in., and 77 in. diameter, and a stroke of 54 in.; three boilers fitted with Howden's forced draught. When running the lights the speed attained was 13·6 knots, everything working in a satisfactory manner. The owners were represented by Mr. Douglas Macgregor, one of the partners; Captain Duke, marine superintendent; and Mr. W. C. Roberts, engineer superintendent. After remaining at the Tail of the

Bank for a few hours, the ship proceeded on her voyage to New York.

Minneburg.—On Friday, April 10th, the steel spar-deck steamer *Minneburg*, built by Sir Raylton Dixon & Co., Cleveland Dockyards, Middlesbrough, for the Hansa Steamship Co., Bremen, was taken out to sea for her official trial trip, under the command of Captain Schwarz. Her dimensions are:—Lengtn, 323 ft.; beam, extreme, 42 ft. 6 in.; depth, moulded, 25 ft.; with a deadweight capacity of about 3,600 tons. The poop, bridge and forecastle decks are of teak, and handsome accommodation is provided for captain, officers, and engineers in houses on bridge-deck. Quadruple-expansion engines, built to German law requirements, have been supplied by Messrs. Wigham Richardson & Co., Newcastle-on-Tyne, having cylinders 19½ in., 28 in., 42 in., and 61 in., by 42 in. stroke, with two large boilers working at 215 lbs. pressure. The hull and machinery have been constructed under the supervision of Mr. D. Wulff, superintendent engineer of the Hansa Co., and have been specially designed for the River Plate trade. At the conclusion of the trials, which passed off most successfully, the vessel proceeded to Bremen to load.

Okinawa Maru.—On April 10th the steel twin-screw cable steamer *Okinawa Maru*, completed her official trials on the Clyde. She is a spar-decked vessel, arranged and fitted for laying and repairing ocean telegraph cables, built and engined by Messrs. Lobnitz & Co., Limited, Renfrew, to the instructions of Mr. A. R. Brown, Glasgow, for the Japanese Government. Her dimensions are:—290 ft. by 40 ft. by 24 ft. 6 in. moulded, and the trials in all respects gave satisfactory results.

Rakanoa (late Bells).—On April 11th the new steamer *Bells*, recently built by Messrs. W. Dobson & Co., Low Walker, for Messrs. George and Charles R. Bell, was taken for trial at sea. This steamer has been sold by Messrs. Bell to the Union Steamship Co., of New Zealand, and her name changed to the *Rakanoa*. The trial, notwithstanding the boisterous weather, was very satisfactory. The engines, supplied by Messrs. Blair & Co., Limited, Stockton, worked without a hitch, and an average speed of 10½ knots was obtained.

Glengoil.—On April 11th an official trial trip was made outside the Tyne by the s.s. *Glengoil*, the property of Messrs. Lindsay, Gracie & Co., Newcastle. The vessel, which has been carrying general cargoes for some 13 years, was sent about three months ago to the Wallsend Works of the North-Eastern Marine Engineering Co., Limited, to have her engines converted from compound at 85 lbs. pressure, to tri-compound at 160 lbs. pressure, and to receive two large single-ended boilers suitable for the increased working pressure, in place of the two double-ended low-pressure boilers originally fitted. The engines have now cylinders 21 in., 35 in., and 56 in. by 48 in. stroke, these being fitted over the old bedplate with a new crank shaft. Apart from the very considerable saving effected in the coal consumption due to the alterations to the machinery, the cargo capacity of the vessel has been largely increased, and she will now carry 150 tons more deadweight cargo than formerly, the speed remaining the same. In addition to the alterations to the propelling machinery, extensive repairs and renewals to the hull have been carried out. The alterations and additions to machinery were to the specification and under the superintendence of Messrs. W. Menzies & Co., of Newcastle, Captain Turnbull Potts supervising the survey and repair work to hull on behalf of the owners. The wind and strong sea made the test a severe one. The vessel, however, averaged 9½ knots over the measured mile, and the modernised character of her machinery gave great satisfaction. The *Glengoil* subsequently proceeded to Genoa, carrying 4,500 tons of coal.

Dorothy.—On Monday, April 13th, the s.s. *Dorothy* was handed over to her owners, Messrs. J. S. Allison & Co., West Hartlepool, by Messrs. Ropner & Son, Stockton-on-Tees, by whom she has been built. The steamer proceeded down the river with a large company of ladies and gentlemen on board, and on her arrival in Tees Bay the compasses were duly adjusted, after which a very pleasant and satisfactory run was made to the Tyne; the machinery, which has been supplied by Messrs. Thomas Richardson & Sons, Hartlepool, working in a highly satisfactory manner. The owners, who were present at the trip, expressed their entire satisfaction on the results of the trial, both in regard to the vessel and the machinery, &c. The steamer will load in the Tyne for a Mediterranean port.

Berkshire.—On April 13th the s.s. *Berkshire*, built by Messrs. Priestman & Sons, Sunderland, went on her trial trip, and was delivered to Messrs. Thompson, Elliott & Co., Newcastle, who will run her in the Mediterranean and Black Sea trades. The *Berkshire* is a steamer of 3,550 tons deadweight, and is the latest addition to the fleet of Messrs. Thompson, Elliott & Co. She is now loading a cargo of coals in Tyne Dock for Genoa.

Clarence.—On Saturday, April 18th, the s.s. *Clarence*, which has been built to the order of Mr. F. le Boulanger, of Swansea, by Messrs. Craig, Taylor & Co., of Thornaby-on-Tees, proceeded to sea on her trial trip, which proved highly satisfactory. The engines, which have been constructed by Messrs. Westgarth, English & Co., of Middlesbrough, worked without a hitch, and a speed of about 11 knots was maintained during a run of over three hours. The dimensions of the boat are as follows:—254 ft. by 37 ft. by 18 ft., the engines being 19 in., 31 in., and 51 in. by 33 in. stroke, with two large boilers working at 160 lbs. pressure. The owner was represented by Mr. George Eldridge, of London, and Captain F. Dinan, the latter of whom will take command of the vessel.

Margarita.—On Saturday, April 18th, the saloon paddle steamer *Margarita*, built and engined by Messrs. Blackwood & Gordon, engineers and shipbuilders, Port-Glasgow, went down the Firth on her official trial trip. As a result of six hours' steaming, a speed of fully 11¾ knots was attained, which gave complete satisfaction to the owners' representatives, being in excess of the guaranteed speed contracted for. This steamer has been built to the order of the Algeciras (Gibraltar) Railway Co., of Algeciras, and is to be employed in their trade between Algeciras, Gibraltar, Tangiers, and Ceuta. Her dimensions are 137 ft. by 20 ft. by 8 ft. 1 in., with compound diagonal engines indicating 600 H.P. She is built to Lloyd's 100 A class, and to Board of Trade requirements for passenger service. The first-class saloon is placed on the main deck, and is handsomely fitted up and upholstered in old gold velvet; above the same a promenade deck with awnings is fitted up for fully two-thirds the length of the vessel, and being carried out the full breadth, gives ample deck space for passengers' accommodation. Clarke Chapman's direct steam windlass is fitted forward, and in engine-room a See's ejector has been fitted for the speedy discharge of ashes. The steamer has been built under the superintendence of Mr. F. J. Trewent, naval architect, of Billiter Street Buildings, London. The owners were represented on the trial trip by Mr. Browne, secretary of the company, and Mr. F. J. Trewent, their naval architect, and a number of ladies and gentlemen joined the steamer at Gourock Pier. After luncheon Mr. Browne apologised for the absence of the chairman, Mr. Todd, and also of Mr. Alex. Henderson, both of whom had intended to be present, and stated that both he and Mr. Trewent were much pleased with the result of the *Margarita's* trial, and he was sure that when their general manager Mr. Morrison had the vessel on her station she would prove as great, if not a greater, favourite than the *Elvira*, also built for them by Messrs. Blackwood & Gordon. He thought the builders deserved every credit for the manner in which they had carried out this contract, and he would communicate to his chairman, Mr. Trewent's and his own satisfaction with the fine vessel they had now acquired. Mr. M'Geoch, on behalf of the builders, thanked Mr. Browne for his kindly remarks in regard to his firm, and expressed a hope that they might soon have the further pleasure of building some more vessels for the company's service abroad.

Jamaica.—On April 21st the steam fleeter *Jamaica*, owned by the Hull Steam Fishing and Ice Co., made her trial trip. The hull of this steamer was built by Messrs. Cook, Welton & Gemmell, of Hull, whilst the engines were constructed by Messrs. Amos & Smith, also of Hull. The *Jamaica* is 98 ft. long, 20 ft. 6 in. broad, and 11 ft. deep. She has a large boiler, with a working pressure of 170 lbs. to the square inch. Her engines are 35 N.H.P., working up to 200 I.H.P. The cylinders are 10 in., 16 in., and 25½ in. in diameter, with 20 in. stroke. The new ship gave every satisfaction, running on an average nine knots per hour.

Ebani.—On April 25th the s.s. *Ebani* left the port of Hartlepool for her trial trip. The vessel has been built by Messrs. Wm. Gray & Co., Limited, to the order of the African Association, Limited, of Liverpool, for their line of steamers between that port, the continent, and the west coast of Africa. She is a handsomely-modelled steamer of the following dimensions:—Length, over all, 270 ft.; breadth, 36 ft. 2 in.; and depth, 22 ft. 8 in. The vessel takes Lloyd's highest class, is built of Siemens-Martin mild steel, with poop for passengers, having well lighted berths and saloon most tastefully fitted up, smoking-room above, and a luxurious chart-room. The engineers' and officers' rooms are amidships in the long bridge, and the crew's berths in the topgallant forecastle. An ice-room is fitted under the deck, and electric bells in the cabin. An electric light installation has been provided for lighting the vessel throughout. A cellular double bottom is fitted throughout for water ballast. The engines have been supplied by the Central Marine Engine Works, of Wm. Gray & Co., Limited, and they are of the triple-expansion type, of 1,200 H.P., having two large steel boilers working at a pressure of 160 lbs. per square inch. There is also in the engine room electric light machinery, Mudd's patent evaporator, triple automatic telegraph, and other specialities for the economical and convenient working of the machinery. After adjusting compasses the engines were put full speed ahead, and the vessel ran to the south almost as far as Whitby, and back again to Hartlepool, when the speed was found to be 11½ knots per hour. The engines ran in a most excellent manner, there being no heating of bearings, and the boilers kept a steady head of steam with easy firing. Before leaving the harbour the vessel had been carefully inspected by Mr. Holt, chairman of the African Association, Limited, and there were present at the trial Mr. Tunnicliffe, one of the directors of the African Association, Limited, and Mr. E. H. Bushell, the superintendent engineer, under whose supervision the vessel and her machinery have been constructed; Captain Murrell represented the builders of the ship, and Mr. T. Mudd the engine builders. On the conclusion of the trial the vessel proceeded round to Liverpool, where she loads her first cargo for the African coast.

Mataura.—The new steamer *Mataura*, built and engined by Barclay, Curle & Co., Limited, Glasgow, for the New Zealand Shipping Co., Limited, Leadenhall Street, London, has been taken for her trial trip on the Clyde. The *Mataura* is a finely-modelled high-powered steamer, built to Lloyd's 100 A1 three-deck rule and to the Board of Trade requirements for passenger certificate. Dimensions:—435 ft. over all, by 54·3 ft. beam, by 32 ft. moulded depth, and has been constructed with a long bridge amidships, poop and topgallant forecastle. The lower holds and 'tween decks are completely insulated, and fitted with all the latest ideas for the preservation and rapid handling of frozen meat cargoes, the space available for which amounts to about 220,000 cubic feet, and is capable of stowing 90,000 frozen sheep. Her deadweight capacity amounts to about 8,500 tons all told. The machinery consists of triple-expansion engines, having cylinders of 30 in., 49 in., and 78 in. by 54 in. stroke, supplied with steam by three single-ended boilers, fitted with Howden's system of forced draught. The extensive refrigerating plant was supplied by the Linde British Refrigeration Co., Limited. In the course of a few remarks that were made after lunch, Sir Andrew Maclean, the managing director of Barclay, Curle & Co., Limited, referred to the progress of the frozen meat trade, and the benefit it conferred in cheapening the supply of meat, and made some comparison between the New Zealand Co.'s first *Mataura*, a sailing ship of 850 tons, with the present *Mataura* of 8,500 tons. Mr. King, the assistant manager, represented the New Zealand Shipping Co., Limited, on the occasion, and responded to the toast of success to his company. An average speed of about 12½ knots was obtained.

Reviews.

The Naval Pocket Book. 1896. By W. Laird Clowes. London: Tower Publishing Co., Limited.

THE term "Pocket Book" is very often a misnomer, but in the veritable little *édition de luxe* before us it is certainly correctly applied, and it is now possible to conveniently carry in one's pocket a mass of information usually sought for (and frequently not found) in far more ponderous tomes.

In compiling this, the latest (the addenda is corrected to February 1st, 1896) addition to naval literature, the author has endeavoured to provide in handy form a more full and exhaustive collection of facts and figures relating to the modern navies of all nations than has ever yet appeared in any country.

The information given concerns ships of all classes, heavy guns, quick-firing guns, machine guns, small arms, torpedoes, British and foreign dry docks, personnel, measured-mile trials, and much more that is useful; and since the work deals solely with facts, discarding deductions therefrom and all theoretical opinions whatsoever, it may fairly, and with advantage, be held to aim at competition with no other existing publication.

The numerous plans given have been specially drawn for the book, and for such small sketches, show the gun positions and other details with commendable clearness. They also possess the further advantage of being placed in immediate contiguity to the descriptions of the ships they illustrate.

A valuable feature of the new book, and one likely to prove of special service to the executive naval officer, is the method adopted of giving to each ship a secondary classification based upon her power, size, speed, and newness, and thus ships of approximately equal fighting power may be recognised at a glance by simple reference to the initial letters, A to Z, under which they are classed, such letter appearing at the head of each individual description.

Extending, as it does, to 850 pages (each 5 in. by 3½ in.), the book contains a mass of information, printed in good, bold type on special thin paper, that we had hitherto considered unobtainable at the price, 5s., and we have no doubt it will soon find its way to the hands of all seeking for accurate and recent information on the subject.

The Slide Rule: A practical Manual. By C. N. Pickworth Wh. Sc. Manchester: Emmott & Co., Limited. 1896.

THE first, a (numerically) large edition of this most useful little book was exhausted in some few months after publication, and the rectification of the few errors that were detected in the work constitutes the only material alteration in the new edition, the price, 2s., remaining the same.

Now that the engineer's time is becoming daily more and more encroached upon, by his having placed in his care engines representing every phase of the mechanician's skill, it has become a matter of the utmost importance that he should be able to rapidly and accurately carry out the numerous calculations that, in the course of his daily practice, he is called upon to perform, and for the purpose of these daily calculations, no more portable, and we doubt if any more perfect, instrument than the slide rule exists.

We have gone most carefully through the 56 pages of the book, and we cannot find any process for effecting calculations, from simple proportion to some rather abstruse trigonometrical applications, which the author has omitted to deal with; and be it noted, he has not only given sound and reliable information, but he has managed to impart it in a clear and lucid style only too often found wanting in books of a similar class.

We question if even the most expert user of the slide rule will go through Mr. Pickworth's latest production without learning something that will be of permanent advantage to him.

The Ocean Liners of the World. By W. Bellows. London: Kegan Paul, Trench, Trübner & Co., Limited. 1896.

THE almost nominal price charged for this little volume is no criterion of its interest to our readers. It contains thirteen large reprints of photographs of famous liners. The selection is singularly happy. The Atlantic, where competition, keen everywhere in many respects, is most acute in speed, has the greater number of pictures, as is its due. No less than six New York boats are given. These include the *Campania* and *Teutonic* as worthy representatives of Liverpool and British liners; the *S. Louis* as American in flag and build; the *Furst Bismarck* as the crack vessel of the Fatherland; the *Kaiser Wilhelm II.* as an example of the North-German Lloyd fleet, which, as the writer says, is near the top of the tree in the gross amount of the tonnage it owns. He puts it that the P. & O., who are here represented by their latest mail boat, the *Caledonia*, are the owners of a greater amount of tonnage. That we take the liberty to doubt. The palm in quantity, though certainly not in quality, rests with a comparatively unknown British line, the British India Steam Navigation Co. This company is not represented in the book, and it would not have been a fair selection if it had been, for the line owns no vessels of the class hee portrayed. The French Atlantic boats are shown in the person of *La Champagne*, a very fine specimen, undoubtedly, but it would perhaps have been more interesting if *La Touraine*, their newest vessel and the holder of the French record, had been shown to readers. The P. & O. representative is, as we have said, the *Caledonia*, hitherto exclusively run on the Bombay service. The P. & O.'s friendly rival, the Orient Line, show their newest vessel the twin-screw *Ophir*, while the Cape Lines, now coming into such prominence, give fine specimens of their craft in the Union Liner *Norman*, of Belfast build, and the *Tantallon Castle*, from the Fairfield yard. The *Nile* shows the best the old Royal Mail Steam Packet Co. has, whilst the *Parisian* is Allan's premier ship. The *Ariosto* is a vessel of quite a different type to any of those previously named. She represents the large and famous Wilson Line, but her employment is less ambitious in point of length of mileage of contemplated voyages than those of any of the others, for she runs merely to Baltic ports. The representations are all excellent. The Chevalier Martini's picture of the *Nile* has a softness and a beauty of its own, whilst the instantaneous photos of some of the others show a fidelity which the most conscientious artist could not excel. Take, for example, the bow waves in the *Ophir* picture. The letterpress is brief but it is much to the point. The appalling figures of the P. & O. values carried are beyond the intelligence of any human being. The man who realizes the value of the National Debt, or who appreciates astronomical distances, alone can realize the value of the cargoes shipped in P. & O. bottoms since the early dawn of steam. This is a shilling'sworth which our readers ought certainly to possess

Southampton Docks, Past and Present. Southampton: John Adams & Co. 1896.

This little souvenir of the Hampshire port and its trade contains a good deal of interesting and useful information and reproductions of many of the chief ships that frequent the port. The whole of the regular fleet of the American Line is given, nearly all of the Hamburg Line's express boats, and three North German Lloyd vessels. The Royal Mail also has three and so has the Castle Line, whilst the Union has four, including a specimen of the "G.'s," so much patronised by those voyagers who are not in a hurry, and the *Mexican* as a type of the class of ship only yesterday, as it were, in the forefront of the trade. The most recent Channel steamer of the South Western Railway Co., represents the fleets of the narrow seas, and a P. & O. and a Cunarder appear as representing the hired troopships which now make Southampton their headquarters. The letterpress gives a slight sketch of the development of the docks to their present importance, which is rendered fully intelligible by a map and by illustrations which include the docks themselves, the new graving dock as in course of construction and bird's-eye view of the estate as well as a picture of the great function, the opening of the Prince of Wales's Graving Dock by our future King, in August, 1895. A good deal of useful information regarding the passenger's life on board ship and as to the fleets of the Lines using the port is given, and the pamphlet will certainly be useful to all those who are interested in the development of the port and its shipping.

Gleanings from the Patent Law of all Nations. By W. Lloyd Wise. London: Cassell & Co. 1895.

We have received the first part of this very useful contribution to Patent law literature. The matter contained in it was originally compiled for the magazine *Work*, and is now reprinted in handy form for the use of those who are interested in the Patent law of various countries. This first part contains the countries "A" to "G," and embraces no less than twenty-two. Such important places as France, Germany and Canada come into the present list in conjunction with such unenterprising regions as Borneo and Columbia. A great deal of information regarding each country is afforded besides mere law. The material condition of the state, its principal industries and trades, all are noted so that the inventor may see whether any special place is one where there is likely to be such a demand for his novelty as will justify him in going to the trouble and expense of protecting and working it there. As regards the legal information, a great deal is given in a condensed form. What is patentable, who may take out patents, the procedure fees payable, and the duration of the patent, are all given, as well as any special information that may seem to bear on the question. There is also in some cases an interesting little discussion of the peculiarities of the local law as regards these matters. It seems to us that out of the fulness of his experience Mr. Lloyd Wise has made a very useful book for the use of the inventor and would-be patentee.

L'Aide Memoire de l'Officier de Marine. 1886. Paris: H. Charles Lavauzelle. 1896.

The present issue of this well-known work, so indispensable to the student of the construction and powers of modern navies, contains a new feature. This is an addition of a table, showing the comparative strengths of the navies of the various great Powers. On the necessary principle of drawing the line somewhere, the vessels of the last twenty years only are included, it being perhaps rightly considered that vessels of a greater age are no longer of any value for combatant purposes. It is greatly to be wished that this good principle was recognised and acted upon by the British Admiralty, who are so fond of keeping our oldest and least important ships on foreign stations. This practice is bad every way. The value of modern warships is largely as counters in a great game of bluff. Great Powers like the Continental nations well know what we have in the way of modern vessels. But how are out-of-the-way places like Central American republics to have any idea of our power, and any respect for it, when all the ocular demonstration they are afforded is a visit from the *Champion* or the *Wild Swan*? Another reason against the practice of our Admiralty in this regard is the fact that if they design to use the old ships as patrols in peace, and the new ones as combatants in time of war, they will find that they are the day behind the fair and that the war is over—if we should unhappily be engaged in war—before they ever had time to effect the proposed change. But to return to our review. We find also that vessels completed for sea alone are included, and so we do not see here any vessels building or completing afloat. We are thus put in a position to see the relative strengths of any two Powers or combinations of Powers. But as we must always look ahead in these matters we are enabled to form an adequate opinion of the work being undertaken by each of the Powers, from appendices to this table, where the vessels completing and building are shown separately. These tables are a little more than up to date in one point, as they show four thirty-knot torpedo-boat destroyers in the British Navy as undergoing their trials in 1895. As we write, in the beginning of March, 1896, none of the trials of these boats have yet taken place. Under the head of the Argentine Republic we think that one vessel appears twice under different names. The cruiser *Garibaldi* was surely the vessel bought from the Italians and re-named *Martin*. Yet the one appears as undergoing her trials and the other as building. A most interesting review of the results of the Chino-Japanese war is also afforded, and this will well repay study. The usual tables, giving the names and details of the various ships in all the navies are given, and these are, as on the previous occasions, quite up to date, and very accurate, so far as we can check them. Full descriptions of the various type vessels in the various navies are afforded. The useful information as to manning the different services, the respective rates of pay, notes on international law, tables regarding marine artillery and as to telegraph cables, follow in their place. The book, as a whole, is one which is quite indispensable to the man who would be informed as to the situation of things in the naval world

Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—Ed. M. E.]

COMPOUND MARINE BOILERS.

To the Editor of The Marine Engineer.

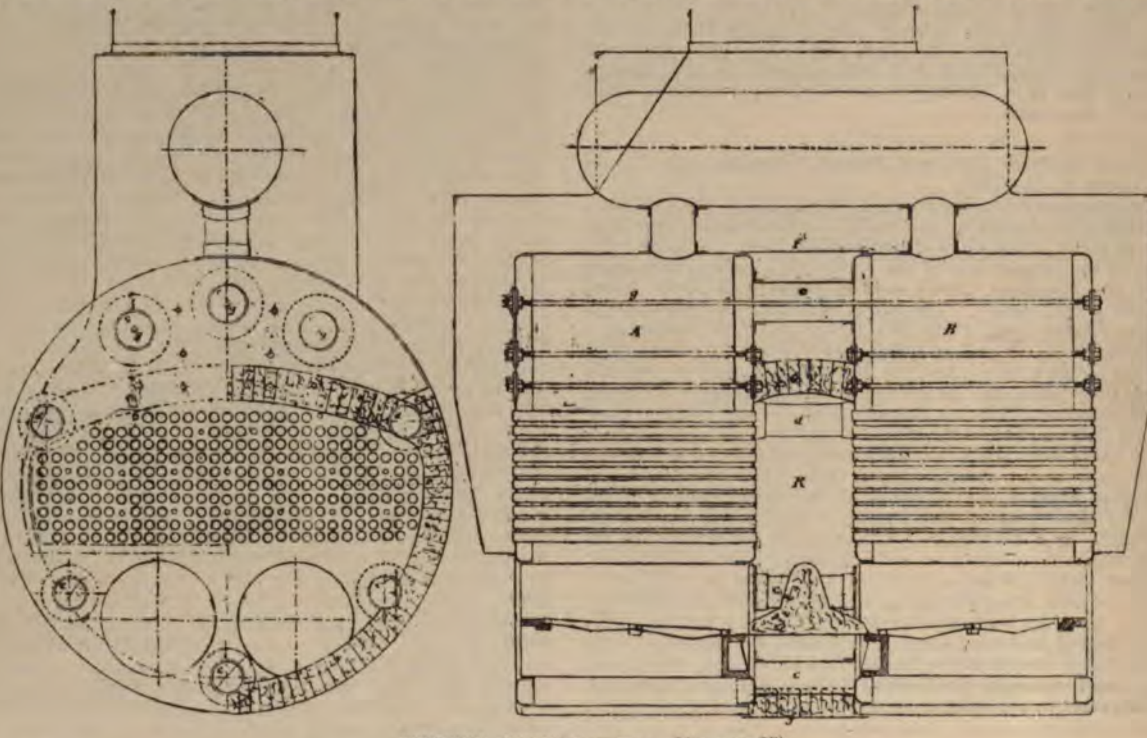
Sir,—I have read with great interest the article on the new compound marine boilers, By Colonel N. Soliani, Director of Naval Construction, Italian Navy, which appeared in your number, April 1st, 1896.

I beg to observe that in the year 1884 I published in the periodical of the Imperial and Royal Austrian Hungarian Navy, *Mitteilungen aus dem Gebiete des Seewesens,* a system of uniting two separate boilers by means of tubes, as published in the above mentioned number of your Journal.

The enclosed photoprint is a copy of the one printed in the Austrian Hungarian periodical.

I remain, Sir,
Yours truly,
CONSTANTIN WEZSCHAIDER,
Trieste, *April 10th,* 1896. Superintendent Engineer.

[WE have been requested to insert the following correspondence between the Institute of Marine Engineers and the Admiralty as to the privilege desired by the engineers of the Royal Naval Reserve for a short period of active service in the Navy. There is no doubt in our mind that this privilege must be shortly granted or the Government will be in the dilemma that they either consider the innate intelligence of the engineers of the R.N.R. is so superior to the other branches of the Reserve that they require no special training to suit them for any form of service, or that they are regarded as of no use at all. We do not think the Admiralty can well accept either alternative.—ED. M. E.]



COMPOUND MARINE BOILERS. (*See page* 89).

THE ROYAL NAVAL RESERVE.

Institute of Marine Engineers,
58, Romford Road, Stratford,
28th March, 1896.

To the Admiral Superintendent,
The Royal Naval Reserve,
Vice-Admiral E. H. Seymour, C.B.,
28, Spring Gardens, S.W.

SIR,—By request of the Council of the Institute of Marine Engineers, I beg to place before your consideration the view entertained by the Members and Council of the Institute in regard to the "Royal Naval Reserve Engineers," with the object of an improvement being made in the conditions at present ruling in respect to this branch of the Reserve, and at the same time dealing with an anomaly which is looked upon as a source of weakness to our Reserve.

A paper on the subject of "Engineers in the Royal Naval Reserve" has recently been read to the Institute by one of the members, Mr. Frank Cooper, and in the course of the discussion a resolution was passed by the members assembled, and unanimously remitted to the Council to give effect to.

The resolution was couched in the following terms:—"That this meeting of the Institute of Marine Engineers having unanimously agreed, after prolonged discussion and mature consideration, on the advisability and necessity for admission of engineers of the Royal Naval Reserve to the privilege of serving for twelve months on board Her Majesty's ships, under similar conditions to that of the Navigating Department of the Royal Naval Reserve, hereby request their Honorary Secretary to immediately communicate with Sir W. White, C.B., Sir Thomas Sutherland, M.P., A. J. Durston, Esq., C.B., the past Presidents, and Sir Edwyn S. Dawes, K.C.M.G., our newly-elected President, and others, with the view of laying before the Admiralty the urgent necessity of granting permission and giving encouragement to engineers of the Royal Naval Reserve to offer themselves for active service for a time on board Her Majesty's ships, so that should occasion arise in which their services might be called into requisition, they may be fully prepared to undertake on the shortest notice the daily routine of the engineer officer of a war steamer under service conditions."

In now conveying to you this resolution, I would try to point out that this Institution is most anxious to give the utmost support to any plan which may commend itself for the advancement of the responsible arm of national defence which is under your able guidance.

I will take the liberty of forwarding to you a copy of the paper read on the subject and a report of the discussion as soon as they are printed, and would ask your kind indulgence in the perusal of them, believing that the views expressed will present the object in view to your willing consideration.

Briefly expressed, it is felt that in order to give the "Engineers Branch of the Reserve" an opportunity of becoming efficient for an emergency, the privilege of 12 months' service in the Navy should be granted to the engineers enrolled in the Royal Naval Reserve, as it is already granted to the reserve officers of the Executive Department, and it will be esteemed a favour if you will kindly give the question your consideration, with a view to a recommendation being given to the Admiralty that the desired privilege be granted.

In accordance with the terms of the resolution, our President and past Presidents and others, are being communicated with on the subject, so that you may receive support in endeavouring to improve the conditions of the Reserve.

I have the honour to be
Yours faithfully,
JAS. ADAMSON,
Hon. Sec.

Admiralty, Whitehall,
London, S.W.
April, 1896.

SIR,—I have the honour to acknowledge the receipt of your letter of the 28th inst., bringing to my notice the unanimous resolution of the Institute of Marine Engineers in regard to the desirability of engineer officers of the Royal Naval Reserve being allowed to undergo 12 months' training in the Royal Navy, so that should they be called upon to serve on an emergency they may be fully prepared to undertake on the shortest notice the daily routine of the engine-room of a man-of-war under active service conditions. In reply, thereto, I have the honour to inform you that I have submitted your letter for the consideration of the Lords Commissioners of the Admiralty.

I have the honour to be, Sir,
Your obedient servant,
(Signed) C. H. SEYMOUR,
Admiral Superintendent.

Jas. Adamson, Esq.,
Hon. Secretary,
The Institute of Marine Engineers,
58, Romford Road,
Stratford.

Miscellaneous.

Earle's Shipbuilding and Engineering Co., Limited.—During last month Earle's Shipbuilding and Engineering Co., Limited, of Hull, delivered to Messrs. Thos. Wilson, Sons & Co., Limited, of the same town, a fine steel-screw steamer named the *Dido*, 400 ft. long, built for the Bombay trade, and capable of carrying 7,200 tons deadweight. They have completed and handed over to the representatives of the Haytian Government, after successfully carrying through her speed and gun trials, a 16-knot steel gunboat named the *Crête-a-Pierrot*, of 950 tons displacement, constructed under the superintendence of Sir E. J. Reed, K.C.B. Also the steam trawler *Argo*, owned by the Ocean Steam Fishing Co., Limited, of Grimsby, and they have in addition engined the trawler *Prince*, which has been built at Beverley for the Grimsby Anchor Steam Fishing Co., Limited. There is still a good share of Government and private work in hand at this yard.

Hull and District Institution of Engineers and Naval Architects.—The members of the above Institution met on Monday evening, April 20th, at the Institute Rooms, Bond Street, to hear a paper on "Light or Narrow Gauge Railways," contributed by Mr. J. B. Hutchinson. The President, F. H. Pearson, Esq., in the chair. The paper dealt with the probable advantages to agriculturists if light railways were adopted, and maintained that the cost of such lines would at present be so great as to prevent them ever being paying concerns. The paper included a most interesting description of the Natal Railway and its rolling stock and traffic. A lengthy discussion followed, in which Messrs. F. H. Pearson, H. J. Rudgard, E. Williamson, W. B. Dixon, E. Tindall, W. H. Brodrick, and others took part, at the close of which a hearty vote of thanks was accorded Mr. Hutchinson, who in acknowledging same, replied to the various points raised.

Marine Engineer's Examination.—At the Board of Trade Examination, held April 14th to 17th, Mr. H. V. Wilkes passed for extra first-class engineer after preparation by Mr. Thorn, 5, Waterville Terrace, North Shields, making 32 successes in this grade from the above establishment. At the examination for probationary assistant engineer in the Navy, held at Greenwich Royal Naval School April 14th to 16th, Mr. C. E. Vinning passed successfully. This gentleman was also prepared by Mr. Thorn.

Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships, from March 11th, to April 9th, 1896.

5430 E. J. Clubbe and A. W. Southey. Steering gear.
5437 E. L. Walker. Anchors.
5443 J. Proctor. Mechanical stokers.
5459 J. A. Wright. Drip-cock for steam engines.
5500 G. F. Redfern. (F. Fuhrmann, Germany.) Flanging of tubes.
5528 H. McPhail. Economisers for steam generators.
5529 W. S. Simpson. Chain cables for ships, &c.
5538 A. and A. Faure. Unsinkable boats.
5548 E. A. Jennings. Safety water boiler.
5575 A. Pain. Ships' signal lights and rockets.
5597 W. Porter. Corliss valves of steam engines.
5604 J. Kirkaldy. Apparatus for propelling boats.
5612 D. Champion. Pads for boat seats.
5628 N. Soliani. Steam generators.
5643 G. H. Shakespeare. Cylinders for lubricators.
5679 A. and W. Purvis. Pumps.
5681 J. F. Crease. Reducing the draught of ships.
5702 J. Jardine. Tubulous steam boilers.
5726 W. B. Crichton. Steam engines.
5746 H. Cautherley and T. Birtwistle. Steam engines.
5767 E. Pilkington. Seamless metallic tubes.
5787 W. R. Cummins. Steam engines.
5804 B. B. Dadley. Cranes, &c.
5806 J. Howden. Furnace fronts for steam boilers.
5822 D. A. Quiggin. Filtering feed-water.
5856 D. Purves. Steam boilers.
5863 J. Chisholm. Life-saving and swimming belt.
5871 J. McLaren. Gauge for steam boilers.
5887 J. Reid. Otter boards for surface water fishing.
5903 E. Edwards. (B. Fröhlich & Co., Germany.) Furnace firebars.
5933 J. Pollit and E. Wigzell. Pistons.
5943 W. Schmidt. Engines with slide valve gear.
5952 A. C. Whittome. Furnace fronts and doors.
5963 J. Lee. Lowering, &c., ships' boats.
5965 J. A. J. Claudon. Steam generators.
5970 J. Macé. Self-acting steering apparatus for boats.
5972 W. P. Thompsom. (J. L. Judge, United States.) Steam valves.
5985 H. Göhrig. Water-tube marine boilers.
6009 J. Hill. Composition of furnace bottoms.
6011 W. O'Brien. Automatically closing watertight doors.
6016 J. and W. Hayes. Grooved collars for ships' lamps.
6023 F. Wilson. Heating feed-water for engines.
6038 J. R. Watson. Securing tarpaulins to hatches of ships.
6060 W. P. Thompson. (S. Bernstein, Germany.) Lubricators.
6070 J. Ascough and H. C. Fowler. Cocks and valves.
6077 J. H. Dickenson and E. M. Fox. Manufacture of armour plates.
6080 T. G. Clayton. Compound steam engines.
6084 D. Mc'Lean. Yachts.
6095 W. H. Wilson. Water-tube boilers.
6100 W. E. Carmont. Appliance for tubes.
6100 W. E. Carmont. Valve.
6126 J. McClure. Machines for spinning rope yarns.
6135 R. H. Williamson. Furnaces of steam boilers.
6161 A. F. Yarrow. Water-tube steam boilers.
6162 A. F. Yarrow. Water-tube steam boilers, &c.
6163 A. F. Yarrow. Water-tube steam boilers.
6167 N. Soliani. Marine boilers.
6181 J. Weir. Apparatus for feeding steam boilers.
6183 J. Paris. Propellers.
6190 G. Love. Condenser.
6225 W. T. Davies. Compasses and trammels.
6255 P. J. C. Carron. Steam turbines.
6272 W. S. C. Greene. Combined air-lock and bulkhead door.
6316 G. Rollo and M. M. Rollo. Steam boilers.
6331 W. H. Scott. Engines operated by steam.
6335 H. Matheson. Steam generators.
6350 M. Watson and J. G. Joicey. Valve gear of engines.
6351 E. W. Crone and R. Wight. Loading coal into ships.
6354 T. York. Steam boiler furnaces.

6367 B. Robinson. Lubricating crank-pins of engines.
6370 J. H. Maclure and W. A. Massey. Fish-trawling apparatus.
6371 M. Chenivesse. System of propelling boats.
6452 H. Gee. Motors.
6471 J. Allan, C. B. Crowe, and T. A. Reed. Pumps.
6493 S. Pitt. (La Compagnie Internationale des Procédés Adolphe Seigle, France.) Steam boilers.
6532 F. S. Carter. Pistons.
6539 J. Thom and J. S. Clark. Bulkhead doors.
6546 C. Coda. Cranes.
6573 H. J. Dowsing and H. S. Keating. Engines.
6618 W. J. Darling and J. G. Walliker. Rudder.
6627 E. Darby. Anchors.
6636 W. H. Griffiths. Engine.
6661 M. W. Hall. Pumps.
6671 A. F. Eells. Foundations of lighthouses.
6676 D. Purves. Tubulous steam boilers.
6691 P. A. Archipenko. Smoke-consuming furnaces.
6701 D. C. Dalzell. Process of annealing steel.
6704 P. Poggi. (G. M. J. Schoedelin, France.) Pumping apparatus.
6712 J. Ruffle. Coating iron.
6737 J. Patterson. Removing furnace ashes, &c.
6754 W. O. A. Lowe and D. Lister. Boiler furnaces.
6764 E. B. Parnell. Funnels.
6765 E. Smethurst and J. Knight. Manœuvring ships.
6770 H. and W. J. Browning. Steam gauge attachment.
6788 T. Hudson. Disengaging boats.
6804 J. Hamilton. Apparatus for ships' boats.
6863 A. Ransom. Cowls.
6868 E. T. Ferrier. Automatic floating packing.
6872 J. Pinkert Motor for propelling vessels.
6875 J. Bradbury. Bearings for shafts.
6902 E. A. Adams. Steam traps.
6904 J. W. Graydon. Automatic watertight door.
6925 H. Biermann. Electric water gauge, &c.
6935 H. Morris and F. Bastert. Rotary pumps.
6946 A. H. Truelove. Reversing gear for engines.
6960 D. P. G. Matthews. Construction of valves.
6964 F. R. Muzzinghi. Arrangement of torpedo screws.
6974 J. S., R. D., W. D., and H. C. Cundall. Engines.
6980 J. Entwisle (S. N. Smith and E. S. Baring-Gould, United States). Boat propeller.
6984 J. W. Proctor. Watertight doors.
6986 F. Clayton. Stokers.
6992 F. Kindt and J. C. Davis. Raising vessels.
7012 G. F. G. Des Vignes and S. H. Terry. Steam generators.
7014 J. H. Gartrell. Regulating valves.
7021 W. P. Thompson. (La Société Delaperriére, Dida and Aubin, and L. Chambon, France.) Making tubes.
7057 F. Lamplough. Pumps, water motors, &c.
7095 W. Bowden and R. J. Urquhart. Engines.
7116 G. John. Funnels.
7120 C. H. Benton. Governing gear for engines.
7137 W. P. Thompson (M. del Espino, India). Shaft bearing.
7156 J. Inches. Otter boards for trawling, &c.
7160 T. Pattinson and T. Slater. Steam hammer valves.
7163 R. and C. E. Johnson. Motive-power engines
7178 J. Black. Heating of shafting bearings.
7194 J. Southall. Oil motor engines.
7209 R. Howarth. Hydraulic pumps.
7220 E. G. Taylor. Rendering ships buoyant.
7221 J. Rees. Apparatus for corrugating tubes.
7222 A. S. Elmore (J. O. S. Elmore, India.) Manufacturing tubes.
7250 J. E. Bousfield. (La Société des Procédés Desgoffe et de Georges, France). Pumps.
7256 J. W., T. T., and E. A. Boaz and W. Gillings. Tubes.
7257 G. Zihikian. Funnels.
7260 A. G. Parrot. Governing devices for engines.
7272 F. B. Last and J. R. Wright. Manufacture of steel.
7274 R. Deissler. Smoke-consuming furnaces.
7281 A. Boriss. Instrument for centreing shafts.
7284 W. L. Dobbie. Fittings for rigging of yachts.
7297 J. J. Butcher, Thompsonville, Connecticut, U.S.A. Steam boilers.
7303 C. W. G. Little. Measuring the power of steam engines.
7330 L. S. d Iszoro. Steam engines.
7346 A. G. Ramage. Apparatus for propelling ships.
7347 W. Bell. Awning stanchions for use on ships.
7362 J. Entwisle (E. T. Sederholm, United States). Steam generators.
7400 C. E. Bergman. Steering gears for vessels.
7428 J. Hodson and H. S. Clement. Regulating pumping engines.
7431 R. Boutflour. Ship steering mechanism.
7449 S. Dure. Dry-docking ships.
7455 R. Hewson and Messrs. Whyte and De Rome. Steam turbines.
7473 M. Berger. Steam valves for steam cylinders.
7475 H.H Franklin. Shallow-water signals for vessels.
7486 J. Morton. Nautical instruments.
7493 J. Carmichael. Opening, &c., watertight doors.

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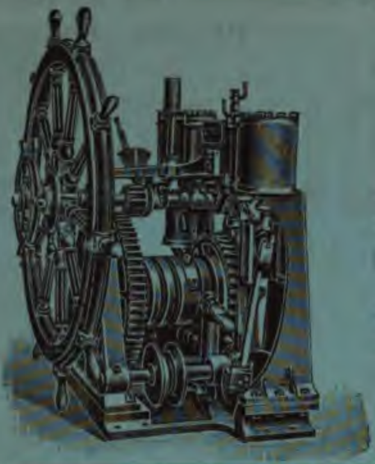

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MARINE ENGINEERS

WRITE

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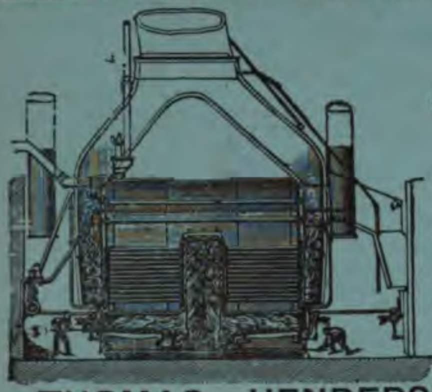

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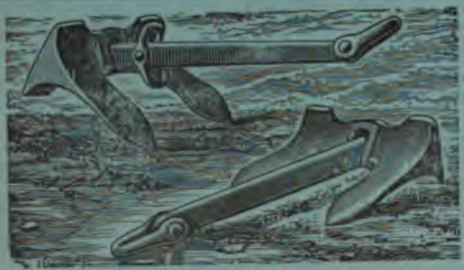

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The Marine Engineer.

LONDON, JUNE 1, 1896.

WATER-TUBE boilers have a great deal to answer for. They have not merely introduced bitterness amongst the supporters of the Scotch cylindrical system of boilers, and set parliamentary members at loggerheads with the Admiralty, but owing to the interest evolved from their construction as to the nature of water circulation, the professors and one of our valued contemporaries in engineering literature are wrangling as to the true theory of the cause of the said circulation. As practical men we must be thankful that there is little or no difference of opinion as to the resultant facts, and we think Mr. Yarrow's experiments have fully set at rest the fact, that even if we can't decide the why and wherefore of the theory of circulation, the intelligent atoms seems to know their own business so well, that they choose and determine their own up-cast and down-comer tubes according to the amount of intensity of evaporation. It would appear that the difference of opinion amongst the professors is as to whether the eventual circulation of the water arises from a disturbance of statical pressure in the up-cast and down-comer tubes, or whether the movement is due entirely to frictional entraining of the water by the bubbles of steam. Professor Lambert maintains that internal action and reaction within a body cannot tend to raise the mass as a whole. This appears to be incontrovertible, as we cannot conceive an internal coiled spring within a pipe whose pressure and reaction is absolutely contained within the pipe, producing any moving or translating effect upon the pipe as a whole. Professor Watkinson, however, attempts to show an inductive or entraining action of the bubbles upon the water by drawing beads upon a string through a pipe and thus producing an artificial circulation. That such entraining action can be produced when external force is applied, nobody, not even Professor Lambert, denies. The very common experiment of revolving a smooth vessel, such as glass, containing water, until the whole contents are entrained by the sides to revolve with it, obviously proves this fact; but both in this latter case, and in the case of the beads, the operative force is external. Professor Lambert admits no external force in a heated tube, but considers the movement of the bubbles to be due only to the internal reaction of the water, and as action and reaction are always equal dynamically, there is no apparent motive force, except a difference of statical density pressure, to cause any complete upheaval of the volume of water in the up-cast tube. This is the crux. And where professors disagree it is dangerous for a marine engineer to intervene; but we should respectfully like to reconcile the professors by the suggestion that there is an external force outside the up-cast tube, even when there is only heat applied to the water. Heat by Professor Tyndall's dictum, is a "mode of motion," that is, is probably a vibration, and since it emanates from an external exciting cause, may it not be the missing external force which would reconcile the learned professors' differences? If the hint is worth anything, we shall expect yet to be enrolled in the circle of the elect.

THE Petersen compound water-tube boiler is a new competitor for honours amongst the already better known water-tube boilers of Messrs. Yarrow and Messrs. Babcock & Wilcox, Limited. These three boilers were put through their facings as to merit, so far as these could be shown diagrammatically, before the last meeting of the Bristol Channel centre of the Institute of Marine Engineers, and the Petersen tyro boiler seems to have held its own amongst its older rivals. Mr. Atkins, who represented the Petersen boiler, claims for its construction a beneficial effect upon the steam, and that a throttle action of its compound tubes makes drier steam than is usually produced in water-tube boilers, and claims also as an important advantage that all parts and tubes are put together, and may be taken apart by mechanical joints without damage to any part. Mr. Atkins does not believe that any cleaning is necessary, for the interior of the tubes of water-tube boilers, and thus endeavours to discount criticism that the tubes of the Petersen boiler are not straight. As there are other bent-tube water-tube boilers, such as Thorneycroft's, with an excellent record, there seems to be something in this belief. The chief recognized trouble with all water-tube boilers is to keep the exterior of the tubes free from soot deposit, though this would not appear to be so great as to require scrapers. The performance of this boiler evaporating 11·25 lbs. of water per lb. of coal, from and at 212° F. when burning 16 lbs. of coal per square ft. of grate, is a very creditable one, though it was stated that 13 lbs. evaporation efficiency had been reached in a special experiment with very slow combustion. Of course the makers of those water-tube boilers which have straight tubes, readily accessible for cleaning, are not prepared to admit that this is an unnecessary precaution, and the accessibility for cleaning is one of the advantages claimed by such makers. No doubt this question of internal fouling in water-tubes will depend much upon the quality of water used and the care taken to filter the same, and to deposit such carbonates as the water may contain before entering the boiler. Perhaps the rapid circulation in the constricted space of the water-tubes carries such deposit as may tend to form away from the interior of the tubes. On this point, as on many others, we must still look for the results of long-continued service before an authoritative opinion can be expressed. The marine engineers of Bristol are, however, carefully collecting and absorbing such information as can be obtained upon the subject.

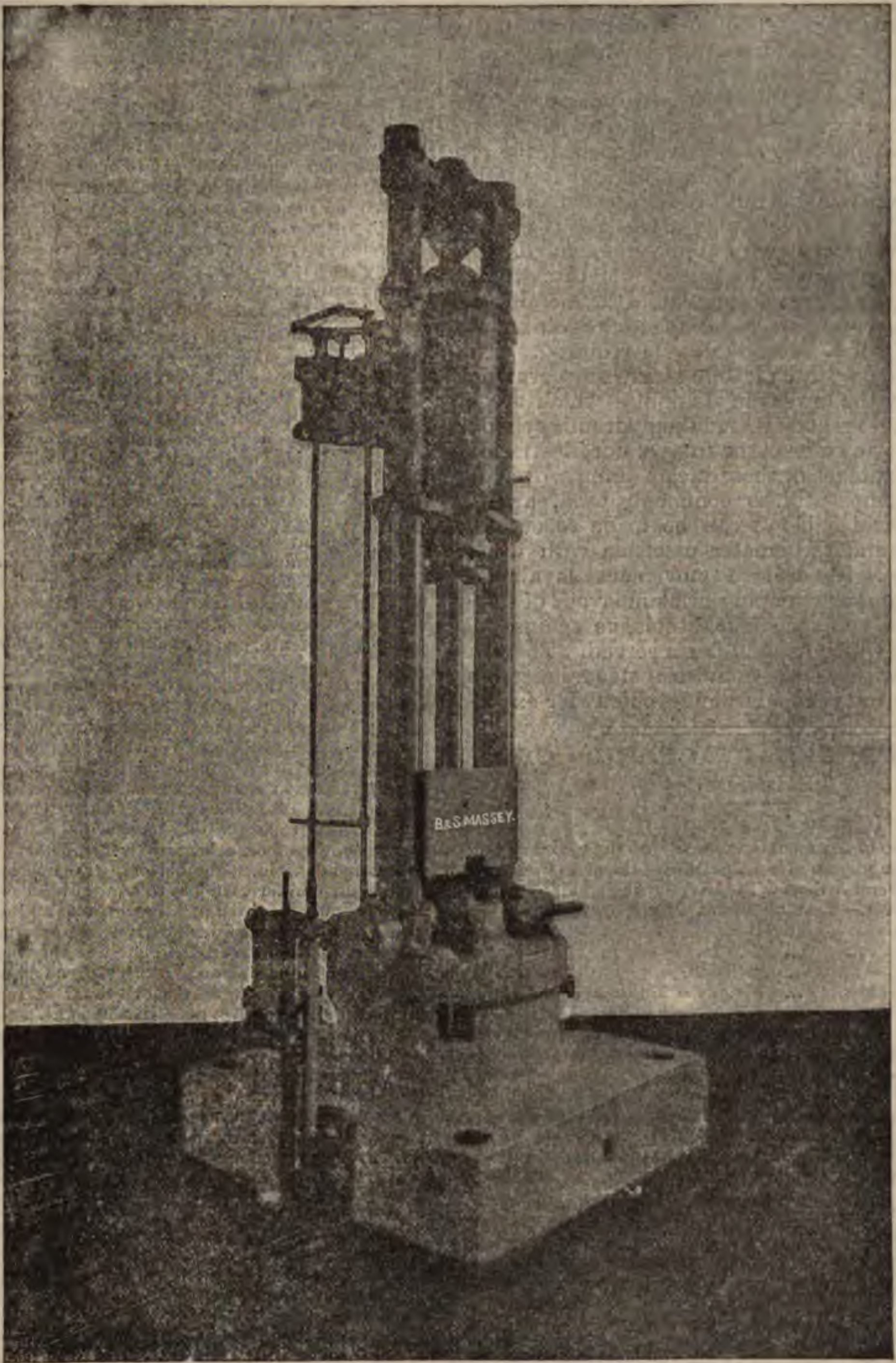
THE members of the Institute of Marine Engineers in their last meeting at the end of April were much interested in the discussion as to the merits of white metal for marine engines, as compared with the usual brass or gun-metal. The experiences contributed were very conflicting, some critics speaking feelingly of the difficulties and trouble attending the use of white metal in bearings in their own experience, and others giving instances of excellent records of prolonged wear without renewal or trouble, and some instances where the substitution of white metal in eccentric straps had entirely remedied excessive wear which had formerly taken place on the brass liners. These varied, and apparently contradictory results would, we think, have formed a most valuable record as to the behaviour of white metal as compared with brass or gun-metal, had the speakers been able to have given the various compositions of the metals in the different cases, and the probable pressure per square inch upon the bearings in the different instances. The term "white metal" is most vague and unsatisfactory, as anyone may make up a white metal that, when made, may be of the most indefinable character. A small admixture of one or other white metal, such as arsenic or antimony, with other white metals such as tin, spelter, or lead, will entirely alter the ultimate character of the alloy, and it is therefore evident that a ductile, greasy white metal on a bearing where the pressure per square inch is small, may give excellent results in that position but would be useless in a bearing, where there is heavy pressure per square inch, or where there is a constant reciprocation of the bearing producing blows. The pressure per square inch is usually heaviest upon crank pins in any engine so we are not surprised to hear that big ends so fitted give trouble. On the other hand, eccentric straps have a large surface for the pressure and a steady rubbing contact, where a greasy metal would have every chance to wear well. One of the known dangers also with white metal is that the bearings of this metal will get soft, and gall, and strip, thus increasing the trouble, at a much lower temperature than is the case with brass or gun metal, hence white metal bearings must be kept fairly cool and must have large surface, that is, have small pressure per square inch to enable them to run cool. There seems to be a concensus of opinion that white metal does not run well where in contact with water, and that a mineral oil seems to give the bearings in white metal the best chance of good and easy wear.

OUR shipbuilders must look to their laurels, and the shipwrights and engineers must learn that internal quarrels are a rival's opportunity, when we examine the enormous strides that foreign shipbuilders, and particularly those of Germany, have lately been making. During the recent deplorable strikes in Scotland, foreign owner after foreign owner gave contracts to the German shipbuilder, and it looks as if such business means to stay with them. The tonnage now produced in German shipyards is three times that produced 10 to 12 years ago, and it is in the last few years that the progress has been most rapid, the increase in the last three years having been about 100 per cent. The enormous extension of the "Vulcan" yard at Stettin, the splendid new Schichau yard at Dantzic, and the development of the Blohm and Voss yard at Hamburg show plainly, to those who have seen them, that the Germans mean to meet any chance of orders with full determination to cope with them, and to keep repeat orders for the future. In one yard alone the increase of turnover has been from 7,000 to 30,000 tons in 12 years. The largest sailing ship afloat is of German, not of British build, and was launched a few weeks ago from Geestemunde, with a tonnage of 6,150 tons, and any of the large German yards will contract for the largest and fleetest steam greyhounds required. Apparently these facts are not generally recognized in England, and some journals pander to our insular vanity by trying to depreciate the efforts, and what is worse, the actually accomplished results of those efforts, of our continental rivals. It is said on good authority that the depreciatory statistics of the ship production of our rivals can only be arrived at, and is so arrived at, either by ignorance of the existence of many flourishing shipbuilding yards abroad, or by a wilful ignoring of their products. We believe it is much the same as regards other countries than Germany. The production of the Austrian Lloyd's is often overlooked, and also the production of the Imperial dockyards. Italy also is doing her best to build for her own necessities, and Belgium and France are not to be despised as rivals.

Hopper Dredger Contract.—Messrs. Wm. Simons & Co., Limited, Renfrew, have received an order to construct a large and powerful hopper dredger for Devonport. The vessel is to be employed in removing blasted rock, and is the second vessel ordered for this purpose.

POWERFUL STEAM STAMP.

DURING a recent visit to the works of Messrs. B. & S. Massey, engineers, Openshaw, Manchester, we had an opportunity of inspecting a couple of unusually large and powerful steam stamps, which the firm had just completed for one of the important shipbuilding yards in the north of England, for stamping parts of guns. The accompanying illustration shows the general construction of this special tool, which is of the pillar form, the tup sliding between round hollow iron pillars, through which strong, stout bolts pass from the bottom of the baseblock to the nuts at the top of the stamp, and bind the whole firmly together. The stamp, which is of the 15 cwt. size—that is, the falling parts weigh 15 cwt.—is



double-acting, the steam being employed not only for lifting, but also for accelerating the fall of the tup. The massive base-block, which weighs 12 tons, is a single casting, and has firmly fixed in its upper surface four massive poppetts, with screws for setting and holding the lower die. The surface upon which the lower die rests is raised above the main level of the top of the block, so as to prevent the dies making a hollow in the upper surface of the block, after long use. The stamp is provided with the firm's usual stamping gear, by which, as soon as the stop valve is opened, the tup rises to the top of its stroke against a substantial buffer, and there remains until the lever is pulled, to cause it to fall and strike its blow, when it is thrown down by the top steam with tremendous force. On the lever being released it immediately returns to the top, and can either be left there while the metal is removed, or caused to strike the dies together again almost instantaneously if a second blow is required. The stamps are fitted with hydraulic kicking-out gear for loosening from the lower die stampings which are of such a form as to require it, and the hydraulic cylinder of this gear is shown near the front of our illustration. The great advantages of these steam stamps over the crude kick stamps still so commonly used, are the rapidity with which blows can be made to succeed one another, and the greater precision with which the dies meet. A decided movement is already taking place among stamping firms in favour of these more accurate and mechanical tools, as against the old appliances which have hitherto served. The firm are also busy with a large number of steam hammers, with wrought-iron rivetted framing, chiefly for export.

THE STRENGTH OF CYLINDRICAL SHELLS.

(Continued from page 72.)

THE sheet plate of the model was made of the ordinary mild steel used for boiler plates. A cutting of the plate was tested by Messrs. John Penn & Sons with the following result:—

TABLE No. 1.—TEST OF SHELL PLATE OF MODEL.

Length of sample ...	2 in.
Width	2·01 in.
Thickness...	·0675 in.
Breaking strength ...	3¾ tons = 27¾ tons per sq. in.
Elongation	·575 in. = 28¾ per cent.

Experiments.—The model was first tested with water, with the ends loose and free to move, the end rings and all the end bolts being taken off. Under these conditions the longitudinal joint commenced to open out almost as soon as the cylinder was full of water and opened out ¼ in. under a head of water of 12 in. That is to say the resistances due to the friction of the joint, to the stiffness of the plate, and to the india-rubber liner, all added together amounted to about ½ lb. to the inch, a quantity which may be neglected in an experiment of this kind. The strength of the shell as an "endless ring" having been thus ascertained, the end rings were bolted on. Pressure was again applied, and the measurements recorded in Table II. were taken at various pressures.

When the pressure reached 270 lbs. the india-rubber liner gave way, and the leakage of water prevented any more measurements being taken, or the pressure being increased. On examination it was found that the liner had been punctured by being forced into a small crevice at the end of the longitudinal joint. As these crevices were certain to increase if the pressure was increased, it was thought useless to replace or repair the liner, as it would have been sure to be damaged again in the same way whenever the joint began to open to the same extent. The experiments were therefore concluded. The shell plate generally showed no signs to the eye of having been seriously strained, except in the immediate neighbourhood of the joint on the unriveted side, where two big bulges, one at each end, can be plainly seen. The loose edge of the shell plate had opened out ¼ in. just about the same, as it had been drawn out with a head of water of 12 in. when the ends were disconnected.

Measurements—For reasons already given, it was thought unnecessary to make any elaborate arrangement for measurements of the model under pressure, and such appliances were used as are to be found in every workshop. It was expected that the T-iron butt strap would have proved sufficiently strong to enable a pressure sufficiently great to be applied to produce a decided and unmistakeable bulging of the plate, but the event proved that the joint was somewhat weaker and the plate somewhat stronger than anticipated, and consequently it was not possible to get a sufficient pressure to produce the permanent and prominent strains in the plate which had been expected, and which would have more than compensated for the absence of exact measurement. Probably a very little more pressure would have strained the plate beyond its elastic limit, but no chance was seen of joint or liner being strengthened so as to get any more pressure, and therefore the measurements which were taken form the basis of the argument.

When testing the model with its ends loose, a line was drawn on the free part of the shell plate at the edge of the butt strap. As the plate drew out of the joint the distance between this line and the butt strap increased. When this distance had reached a ¼ in., the pressure was stopped for fear of damage to the liner. During this test the model was standing on its end, and a pipe was screwed into the coupling fitted for water gauge. The water in this tube rose 12 in. above the water in the model; there was, therefore, a head of water 12 in. at the top of the model, and of 22 in. at the bottom. The exposed part of the shell plate was, therefore, subject to a mean head of 17 in. of water, which is equivalent to a pressure of about 6 lbs. per square inch. Although the pressure was nearly twice as much at the bottom as at the top, the line on the plate was very nearly parallel with the edge of the butt strap. After the ends had been bolted on, the points 1, 2, and 3, were marked off at right angles to the joint, and 4, 5, and 6, near to the joint, as shown in Fig. 6, While the model was subject to the pressures given in Table II. the diameters at the points 1, 2, 3, 4, 5, and 6 were measured with a pair of ordinary callipers, and read off on a taper scale whose width increased at the rate of ½ in. to the foot, or 1-384th in. for each 1-16 in. of height above a datum line. By this scale it was easy to measure fairly accurately the opening between the callipers, but in setting the callipers much would depend on the sensitiveness of hand and eye on the part of the measurer.

TABLE II.—TEST OF MODEL WITH ENDS BOLTED TO END PLATES.
Points Nos. 1, 2, and 3 were at right angles to joint.
„ „ 4, 5, and 6 were 1 in from joint (see Fig. 5).

Pressure on model in pounds per square inch	0	60	100	120	150	180	210	240	270 Liner burst.
Diameter at point No. 1 ...	10·180	10·182	10 185	10·182	10·187	10·182	10·187	10·185	Not measured.
„ „ 2 ...	10·177	10·177	10·177	10·174	10·174	10·172	10·169	10·172	„
„ „ 3 ...	10·156	10·161	10·169	10·167	10·169	10·172	10·172	10·185	„
„ 4 ...	10·172	10·185	10·195	10·208	10·234	10·255	10·297	10·349	„
„ „ 5 ...	10·180	10·195	10·214	10·229	10·245	10·271	10·307	10·359	
„ „ 6 ...	10·161	10·180	10·193	10·193	10·206	10 245	10·291	10·362	

It is difficult to say what margin for error should be allowed on this account. The measurements were taken very carefully, under the superintendence of Mr. May, chief draughtsman at Messrs. John Penn & Sons. Many of these measurements, we understand, were checked over more than once, and in all such cases the readings were remarkably near to each other. Still, the method was such that implicit trust cannot be put in any single figure, but if the whole group of figures is analysed it will be found that they vary in certain order and cannot be the result of casual errors.

TABLE III.—SHOWING ALTERATION OF DIAMETERS AT DIFFERENT PRESSURES.

Pressure on model in pounds per square inch.	60	100	120	150	180	210	240
Change of diameter at No. 1.	+·002	+·005	+·002	+·007	+·002	+·007	+·005
" " No. 2.	0	0	—·903	—·003	—·008	—·008	—·005
" " No. 3.	+·005	+·013	+·011	+·013	+·016	+·016	+·019
" " No. 4.	·013	·023	·036	·062	·083	·125	·177
" " No. 5.	·015	·034	·049	·065	·091	·127	·179
" " No. 6.	·019	·032	·032	·045	·084	·130	·201

Fig. 1

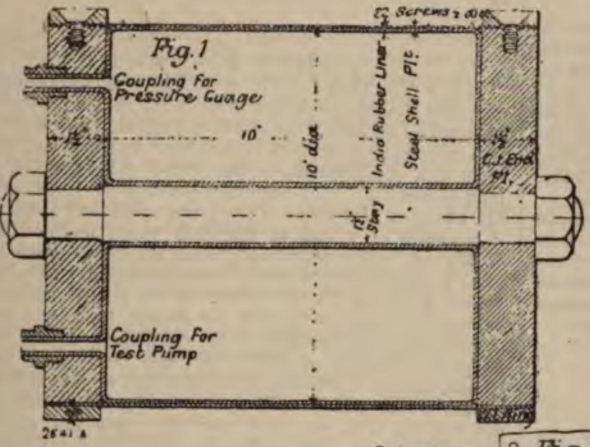


Fig. 2

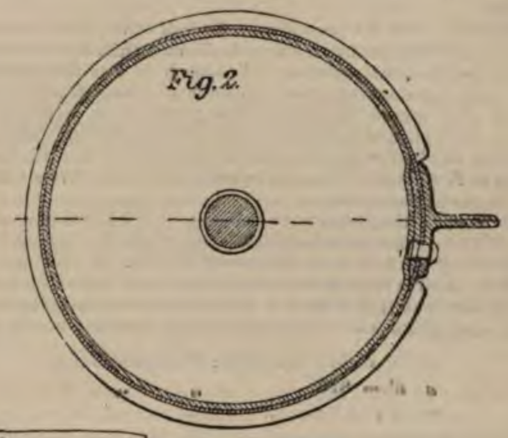


Fig. 3

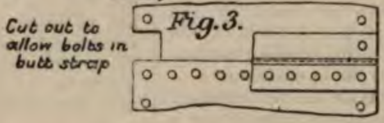


Fig. 4

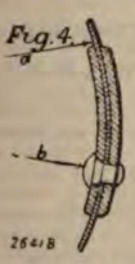


Fig. 5

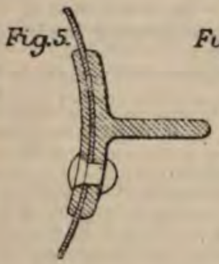


Fig. 6

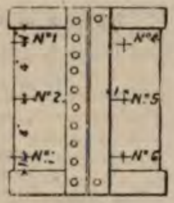


Table 3 gives the alterations in the diameters of the model at points 1, 2, 3, and at 4, 5, and 6.

The measurements at 1, 2, and 3 are all very much less than those of 4, 5, and 6. The first set of figures indicate the behaviour of the plate at a considerable distance from the joint. The second set indicate the behaviour of the plates close to the joint. Comparing these two sets, it is evident that the discrepancy between them cannot be the consequence of accidental errors, but must be the consequence of the joint being sensibly weaker than the solid plate. As the plate ultimately bulged out near this joint and nowhere else, it is evident that local weakness was the cause of the difference between the two sets of figures.

If now the figures be examined showing alterations of diameters at the points 1, 2, 3, Table III., it will be seen that all of them in the first and third line are positive, and all in the second line are negative. This cannot be the result of casual errors. All the figures show a tendency to increase with the increase of pressure. The increase is fairly uniform in the second line of the table; in the first and third lines the increase is there, but not so regular, but even these irregularities seem to follow a certain course. Thus, at 120 lbs. pressure the diameter at all the three points is less than at 100 lbs. pressure. Now it is hardly probable that all these measurements should have a similar error, while it is highly probable that if the centre were depressed, the ends would be depressed with it. Examining the figures as a group, they seem to indicate that the effect of increasing pressure was to deflect the shell of the cylinder by contracting the centre and expanding the ends. If this conclusion is open to question, it can still be said that the thin shell plate of this model stood a pressure of 240 lbs. to the inch, and that the strain from this pressure was so small that it could not be measured by an ordinary pair of callipers.

Analysis of Results of Experiments.—The model having been tested with the ends loose, and with them fastened, we know for a fact that the whole of the pressure on the shell, except a quantity too small to be measurable on a pressure gauge graded to 300 lbs., must have been transmitted to the bolts by which the ends were fastened. At a pressure of 270 lbs. the total load on the surface of the shell of the model would be about 38 tons, a load which must have had some visible means of support, and there was no other means of support but the end bolts. We also know that the pressure on all parts of the shell must have been transmitted to the ends by stresses in the shell plate itself, because, again, there is no other means by which the pressure could have been transmitted. Knowing that a certain load was transmitted through the shell plate to its ends, we can determine one set of stresses that must have been produced by the load.

From the form of the model it is evident that the load would be about equally divided between the ends and uniformly distributed over the bolts in each end. The washer rings at the ends were sufficiently stiff to ensure that at the inner edges of these rings the resistance of the bolts would be evenly distributed over the circumference of the shell plate.

Under these conditions, if Fig. 7 is a section through the model, X O X^1 being its axis, and Y O Y^1 being the centre line of its length, it is assumed that the total load on the shell was evenly distributed over the circumferences of the circles A A^1 B B^1; and that this load was balanced by the resistance of the bolts, uniformly distributed, by means of the washer rings, over the circumference of the same circles. The shell plate at A A^1 and B B^1 must, therefore, have been subject to a uniform shearing stress.

Assuming that the pressure on the half of the shell between A A^1 and Y Y^1 was transmitted to A A^1, and that the pressure on the half of the shell between Y Y^1 and B B^1 was transmitted to B B^1 then the shearing stress per inch of circumference at A A^1 and at B B^1 would equal the total pressure on a longitudinal strip 1 in. wide and half the length of the cylinder. Taking the pressure at 270 lbs. per in., and the length at 10 in., the shearing stress at A A^1 and B B^1 would be at the rate of 5×270=1,350 lbs. per in. of circumference.

Similarly, if the pressure on the ring a a^1, Y Y^1 was transmitted to A A^1 there must have been a shearing stress throughout the section of the plate at a a^1 at the rate of 270 lbs. per inch of circumference. And in the same way it can be shown that if the pressure on the shell was transmitted to the ends, and balanced by stresses in the shell plate, there must have been a shearing stress at

a_2 a^1_2 of 540 lbs. per in. of circumference.
a_3 a^1_3 = 810 " "
a_4 a^1_4 = 1,080 " " "

Whatever other stresses *may* have been produced by the pressure on this model, we can safely say that a pressure of 270 lbs. on it *must* have produced a series of shearing stresses increasing uniformly from 0 at the centre to 1,350 lbs. at each end.

In so far as a cylindrical shell is a vehicle for the transmission of pressure to its ends, to that extent it must be regarded as a beam supported at the ends and uniformly loaded. And the distribution of shearing stress given above is in accordance with the universally accepted theory of stresses in beams.

As a general rule the shearing stresses in beams are so small compared with the bending moments, that they may be safely neglected. Under ordinary conditions it is generally true that a beam which can resist the bending moment due to a load, can be safely trusted to resist the shearing stresses due to that load. We must therefore consider what is the bending moment due to a pressure of 270 lbs. on the shell of a model, and what is the resistance to bending of the shell.

There are two, and so far as we can see, only two, ways of treating this question. We may consider each longitudinal strip, into which the shell of a cylinder may be divided, as a separate and independent beam, or as a subordinate member of cylindrical beam of which it forms a part. Thus a longitudinal slip 1 in. wide in the shell of the model may either be considered as a separate and independent beam, or as forming part of a hollow cylindrical beam 10 in. in diameter. In the first case the neutral axis of the beam would be at the centre of the thickness of the strip, the metal outside this axis would be in tension, and the part inside the axis would be in compression. In the second case the neutral axis of the beam would be the axis of the cylinder, and all the plate on the same side of the axis as the strip would be in tension, all on the other side of the axis would be in compression. The bending moment due to a given pressure on such a strip would be the same in both cases, but the resistance to bending would be very different. The total load on a strip 1 in. wide in the shell of the model, when the pressure was p lbs. per inch, would be $p \times 10$. And the bending moment due to this load would be $= \mathrm{M}_b = \dfrac{10\,p \times 10 \text{ in.}}{8} = 12.5\,p.$

The resistance to bending of the strip, considered as a rectangular beam 1-16th in. deep and 1 in. wide, would be given by the equation

$$\mathrm{M}_r = n f \,.\, b\, h^2,$$

where

M_r = same as the moment of resistance to bending.
n = factor depending on form of beam, $= \frac{1}{6}$ in this case.
f = coefficient of resistance of material of beam.
b = breadth = 1 in.
h = depth of beam = 1-16th in.

In the case under consideration

$$\mathrm{M}_r = \frac{1}{6} \times f \times \left(\frac{1}{16}\right)^2 = \frac{f}{1536}.$$

For equilibrium it is necessary that the resistance to bending equals the bending moment. And, consequently, if the strip is to be in equilibrium under a pressure of p lbs., it is necessary that

$$\mathrm{M}_b = \mathrm{M}_r,$$

or

$$12{\cdot}5\,p = \frac{f}{1536}.$$

$$f = 12{\cdot}5 \times 1536 \times p = 19{,}200\,p.$$

If $p = 270$, then $f = 270 \times 19{,}200 = 5{,}144{,}000$ lbs., that is to say, that if a narrow longitudinal strip of the shell of the model behaved as an independent beam, then at the pressure of 270 lbs. its outer layer must have been subject to a tension, and its inner layer to a compression, at the rate of 5,144,000 lbs. per square inch of section. This condition could never have been fulfilled, the ultimate resistance of the plate being only about 60,000 lbs. A pressure of 2 lbs. to the inch would produce a stress of 38,400 lbs., which is probably much above the elastic limit of the plate's resistance to tension or compression. Now, steel plate, which stretches 28 per cent. of its length before breaking, cannot be strained beyond its elastic limit without showing outward and visible signs of its condition. If the longitudinal strips in the shell of this model had behaved as independent beams, then at a pressure of about 2 lbs. we would have seen the centre of the model swelling out visibly before our eyes. As it did not do this, we must conclude that the strips did not act as separate beams, but as subordinate members of the cylindrical beam of which they formed a part. In this case the bending moment due to a pressure p on a strip 1 in. wide would be the same as in the previous case, namely, $12{\cdot}5\,p = \mathrm{M}_b$; but the resistance to bending of the beam would be, according to Rankine's formula for thin cylindrical beams,

$$\mathrm{M}_r = n . f . \mathrm{S} \times d,$$

Where n = a factor depending on form of beam, in this case $= \frac{1}{4}$.
f = the coefficient of resistance of the material,
S = the area of the section through the beam $= 10 \text{ in.} \times \pi \times \frac{1}{16} \text{ in.} = \frac{31{\cdot}4}{16} = 2$ square inches very nearly.
d = the diameter of the beam = 10 in.

The moment of the resistance to bending is therefore

$$\mathrm{M}_r = \tfrac{1}{4} \times f \times 2 \times 10 = f \times 5$$

And as the condition of equilibrium is that the moment of resistance to bending must equal the bending moment,

$$\mathrm{M}_r = \mathrm{M}_b\,;$$
$$\text{or } 5 \times f = 12{\cdot}5 \times p,$$
$$f = 2{\cdot}5 \times p.$$

When $p = 270$, f becomes $270 \times 2{\cdot}5 = 675$.

That is to say, if a longitudinal strip in the shell of the model acts as a subordinate member of the cylindrical beam of which it forms part, then the bending moment due to a pressure of 270 lbs. on this strip would be balanced by a series of tensile stresses increasing from 0 at the axis of the cylinder to a maximum value of 675 lbs. in the strip itself; and a series of compressive stresses, increasing from 0 at the axis to a maximum value of 675 lbs. per square inch of section, in the other half of the cylinder.

But exactly opposite to the strip which has just been considered there is another identical strip subject to an equal pressure but acting in the opposite direction. The pressure on this strip will produce a bending moment on the cylinder equal and opposite to the former one, and these two bending moments, being equal and opposite, will balance each other.

If, instead of taking the bending moments of strips 1 in. wide, we were to find the total bending moment in any one direction, say, vertically upwards, due to the pressure on the whole of the cylinder, similar results would be obtained.

The vertical component of the pressures on the surface of the top half of a horizontal cylinder is equal to the diameter of the cylinder × its length × the pressure.

The vertical component of the pressure on the top half of a cylinder 10 in. in diameter by 10 long, at a pressure of 270 lbs., is therefore $10 \times 10 \times 270 = 27,000$ lbs. The bending moment due to this load is $M_b = \frac{\text{load} \times \text{length}}{8} = \text{same as} \frac{270,000}{8}$ inch-pounds.

The moment of resistance to bending is as given above, $M = 5f$.

If

$$M_r = M_b,$$

then

$$5f = \frac{270,000}{8},$$

and

$$f = \frac{270,000}{40} = 6750 \text{ lbs.}$$

That is to say, the bending moment tending to deflect the cylinder vertically upward would, if it acted alone, be balanced by a tensile stress in the top half of the cylinder, increasing from 0 at the centre to a maximum value of 6,750 lbs., per inch of section at the top, together with a compressive stress in the bottom half, increasing from 0 to a maximum of 6,750 lbs. This, if it acted alone, would produce a very moderate deflection of the beam, a stress of 6,750 lbs. per inch of section being a safe working load for steel plate. But it does not act alone: the pressure on the bottom half of the cylinder tends to deflect it in the opposite direction, and to precisely the same extent. The consequence is that the resultant deflection is nothing, and this bending moment is balanced by an equal and opposite bending moment.

If the bending moments in any other direction be estimated, it will be found to have the same result: the deflection in any direction must be 0, and the bending moments at all points and in all directions are balanced by an equal and opposite bending moment.

The above argument may be summarised as follows:—In so far as a cylindrical shell is a vehicle for the transmission of pressure to its ends, to that extent it must be regarded as a beam supported at the ends and uniformly loaded. All the stresses on a beam may be resolved into two classes—shearing stresses and bending moments.

With regard to sheering stresses, a detailed analysis shows that the distribution of this stress is precisely the same as in other beams under a distributed load; that it increases uniformly from nothing at the centre of the beam, to a maximum value at each end.

With regard to bending moments, there are two methods of treating this question. According to one of these methods, the resistance to bending in the shell plate of the model is so small that a pressure of 2 lbs. to 3 lbs. to the inch should have been sufficient to wreck the model. According to the other, the resistance to bending is so great, and the bending moments are so evenly balanced, that their influence may be neglected, and consequently that the strength of the shell depends only on its resistance to shearing at the ends. There can be no question as to which of these alternatives is the proper one to apply to this model. The first is utterly untenable, the second is in complete accordance with the results of experiments. Assuming that bending moments were balanced at all parts of the shell, and that the shearing stress had to be balanced by strains in the shell plate it is evident that a stress, normal to the surface of the cylinder, increasing from 0 at the centre to a maximum at each end, would tend to deflect the plate outwards at the ends, making the original straight lines of the cylinder concave towards the centre. It is quite conceivable that stresses tending to deflect the plate in this manner might find it easier to depress the centre than to expand the ends. The rigidity of the end plates, although it could not increase the resistance of the shell plate, might still have some influence on the shape it took. If the end plates had been of the same thickness as the shell plate, instead of twenty-four times as thick, they might have stretched a little, and given precisely the same deflection to the shell plate without any contraction of the centre. However, this is not an important item. But if it be admitted that the measurements at the points 1, 2, 3 (Table III.), taken as a group, may be accepted as evidence that the result of increasing pressure on the shell plate of the model was a contraction at the centre, and an expansion at the ends, then they clearly correspond with the effects that might be expected from a stress increasing from centre to ends.

These experiments were designed to ascertain if the factor of "end resistance" is one worth consideration. So, whether the pressure on the shell of the model was balanced in the way suggested, or in some other way, still the fact remains that it was balanced. And this being so, it may be said that the possible value of the factor in question is of such a magnitude that it deserves careful study and further experiments.

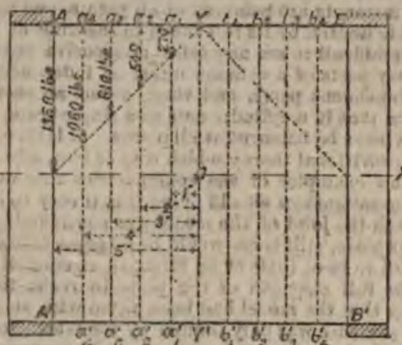
Deductions from Experiments.—One deduction from these experiments is beyond dispute: the longitudinal strips in the shell plate of this model did not act as if they were independent of each other, but as parts of a connected whole; the only partial exception to this being the strips containing, and adjacent to, the joint where the continuity of the circle was, in fact, broken and only imperfectly compensated.

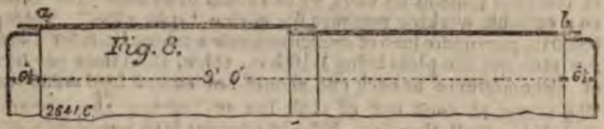
If the shell plate of a cylinder is regarded as a single beam, and not as a collection of disconnected staves, then it follows that bending moments are balanced at all points, and the strength of the shell is limited by its resistance to shearing at the ends; at least it is difficult to see any other alternative but to treat the elementary parts of a cylinder either as independent wholes or else as dependent parts, and there seems no escape from the conclusion that if a cylinder acts as a single beam, then bending moments must be balanced at all points. It is therefore assumed this is a provisional theory which *may be* true, and we will now give a few examples of the consequences that would follow if further investigations should prove that theory to be correct.

Although the joint of the model was considerably weaker than the uncut plate, still there would be no great difficulty in designing a joint to have little or no strength circumferentially, while it had the full strength of the plate to resist radial stresses. Assuming that the model had been fitted with such a joint, and that the pressure was only limited by the resistance to shearing of the shell plate at its ends, we can easily determine what would be a suitable working pressure for such a "split ring." Taking 8,000 lb., per square inch of section as a safe working limit for shearing stresses, the plate being 1-16th in. thick, the stress per inch of circumference at each end should not exceed $\frac{8000}{16} = 500$ lbs. The stress at each end of shell has to balance the pressure on half the shell, therefore, $\frac{500}{5} = 100$ lbs. per inch would be a safe working pressure for a cylindrical shell 10 in. long and 1-16th in. thick, where none of the pressure was balanced by circumferential tension. Let us now compare this with the working pressure which would be suitable for a cylinder of the same dimensions, if fitted with a good longitudinal joint, but with its ends loose. In this case the whole pressure would have to be balanced by circumferential tension at the joint of the shell plate. The tensile strength of steel is greater than the shearing strength in the proportion of about 4 to 3. But the tensile strength of the best possible riveted joint is not much more than three-fourths of the strength of solid plate, so that the safe load on the joint is about the same as the shear on the plate, that is to say, the tension on the joint, and therefore throughout the plate, should not exceed 8,000 lbs. per square inch of section. As the plate is 1-16th in., this limits the tensile strain on plate 500 lbs. per inch, and this, in a cylinder 10 in. in diameter, would just balance a pressure 100 lbs. to the inch. That is to say, the pressure that a cylindrical shell of the dimensions of this model is capable of transmitting to its ends without any assistance from circumferential tension, is approximately equal to the pressure which it could sustain as an "endless ring." And under the assumed conditions, the factor of end resistance, which is now wholly neglected, is of equal value with the factor of circumferential tension, which is considered the sole resistance worth taking into account.

Having determined the pressure that a shell can transmit to its ends without assistance from circumferential tension, and the pressure it can balance by circumferential tension without any assistance from the ends; the next and most important question is: What pressure can be safely applied to a shell where both these factors are in action, where the ends are secured, and the longitudinal joints riveted? It is impossible to believe that the circumferential resistance of a plate, which can safely balance a pressure of 100 lbs. to the in. if its ends were loose, could suddenly vanish or be diminished in the smallest degree if the ends were fastened. It is equally impossible to believe that the resistance to shearing at the ends and throughout the shell plate, which is sufficient to balance a pressure of 100 lbs. to the inch when the strength of the longitudinal joint is reduced to a minimum, could suddenly vanish, or be diminished in the slightest degree, by substituting a strong longitudinal joint for a weak one. Assuming that the resistance to shearing through the plate is independent of the strength of the longitudinal joint, and that the resistance to tension throughout the shell is independent of the strength of the end fastenings, it would seem to follow that the safe working pressure on a shell is the sum of the pressure which it can balance as an "endless ring" plus the pressure which it can balance as a beam. That is to say, if the shell of this model can be safely loaded with a pressure of 100 lbs. to the inch, then, if a longitudinal joint, which could, by itself, stand a pressure of 100 lbs. to the inch was added to its strength, then it should be able to sustain a working pressure of 200 lbs. to the inch. This may turn out to be the case, but until verified by experiment, we should be inclined to doubt it. There is no doubt that fastening the ends of a shell would not diminish the tensile strength of the plate, but the *consequence* of fastening them would be to subject the plate to a series of shearing stresses which are absent when the ends of the plate are free. Now it may be quite true that a plate which can stand a tension in the direction of its length of 8,000 lbs. to the inch, could at the same time stand a shearing stress of the same intensity acting in a plane perpendicular to its length. But, on the other hand, it may not be *quite* true. We know that a tension of 8,000 lbs. or a shear of 8,000 lbs. is a safe load for steel plate, when these are applied separately. It is not so certain that a plate could be safely subjected to a tension and a shear acting at the same time, and both tending to increase the diameter of the shell. A tension of 8,000 lbs. along a plate would certainly not destroy the resistance to shearing through the thickness of the plate; it might diminish this resistance to a slight extent, or it might not diminish it in any way. So that we may conclude that the proper working pressure of the shell of this model, if it had been fitted with a strong longitudinal joint, must be much greater than 100 lbs., it may be 200 lbs., and it probably is not much less than 200 lbs.

Fig 7.





The importance of end resistance is, of course, greatest where the proportion of diameter to length is greatest. In long boilers of small diameter, the end resistance is no doubt a negligible quantity; but in very short boilers, such as are common in marine work, this factor becomes, it would appear, the principal source of resistance.

The shortest boiler in proportion to its diameter of which we have a record is 10 ft. 1 in. long by 16 ft. 3 in. in diameter, working pressure 155 lbs.; and it is proposed to estimate the thickness of shell plate which would be required to balance the pressure—1. Treating it as an "endless ring." 2. As a "split ring" acting as a beam with bending moments balanced. 3. As a combination of these two factors.

In order to satisfy Board of Trade rules the thickness of shell plate for this boiler would be given by the equation: Working pressure = tensile strength of plate × percentage of joint × twice thickness of plate divided by diameter of boiler in inches × factor of safety.

We may take strength of plate at 60,000 lbs. per square inch.

Percentage of joint at 80
Thickness of plate = t
Diameter of boiler = 195 in.
Factor of safety = 5.

The equation then becomes

$$155 = \frac{60{,}000 \times 80 \times 2\,t}{195 \times 5 \times 100}$$

and this gives $t = \frac{9}{16}$ in. (nearly).

We will now estimate the thickness that would be required if circumferential tension was eliminated, and the whole pressure transmitted to the ends and balanced by shearing stresses in the shell plate.

As will be seen by reference to Fig. 8, the shell plate is only exposed to pressure between the points a and b; beyond these points the pressure comes on the flanges, and consequently the shearing stresses at (a) and (b) depend only on the distances apart of these points, which has been taken as 9 ft. = 108 in.

There is no difficulty in making an end joint of equal strength to the solid plate against a radial stress. We may, therefore, base our calculations on the full section of the plate at (a) and at (b).

Taking the shearing strength at three-fourths of the tensile strength—that is, at 45,000 lbs.—and using 5 as the factor of safety as before, we get 9,000 lbs. for the working limit of shearing stress.

If t = the thickness of the shell plate, then $9{,}000 \times 2\,t$ = the resistance per inch of circumferance at (a) and (b). The load to be balanced at these points equals the distance between them multiplied by the pressure = 108 in. × 155 lbs. Therefore,

$$2\,t \times 9{,}000 = 108 \times 155\,;$$
$$\text{or } t = \cdot 93 = \tfrac{15}{16} \text{ in. nearly.}$$

That is to say, a shell plate $\frac{15}{16}$ in. thick would be sufficient for the shell of this boiler if it had no strength as an "endless ring."

We will now suppose the shell to act as an "endless ring," and also as a balanced beam, the pressure on it being uniformly distributed over the shell and the ends. Assuming that the stress is not to exceed 8,000 lbs. per square inch, and taking the full length of the boiler instead of the exposed part.

Under these conditions, let (t) be the thickness of plate required.

The working pressure of an "endless ring" (t) in. thick and 195 in. in diameter would be

$$p = \frac{8{,}000 \times 2\,t}{195},$$

and the pressure on a balanced beam 121 in. in length would be

$$p_s = \frac{8{,}000 \times 2\,t}{121}$$

If these two factors together balance a pressure of 155 lbs. then.

$$155 = p + p = \frac{8{,}000 \times 2\,t}{195} + \frac{8{,}000 \times 2\,t}{121}$$

which gives

$$t = \tfrac{3}{4} \text{ in. nearly.}$$

Summing up these results we find that in a boiler of the dimensions given, if the "end resistance" is ignored, the thickness of its shell plate would require to be 1 9-16ths in.

If the circumferential resistance is ignored, and all the pressure is supposed to be transmitted to the ends, then the plate would require to be 15-16ths in. thick.

If these two sources of strength are added together, then the plate would only require to be $\frac{3}{4}$ in thick.

For reasons given previously the proper thickness would probably be somewhat greater than 9-16ths in., but might be considerably less than 15-16ths in.

Starting out from the fact that the shell of this model stood a pressure of 270 lbs.; while, according to the "endless ring theory is should have had no strength; and according to the methods of analysis on which the "endless ring" theory rests, it should have had so little strength that a pressure of 3 lbs. to 4 lbs. to the inch should have wrecked it, we are justified to the conclusion that the "endless ring" theory can no longer be assumed to be true.

By making a slight change in the accepted theory, by assuming that pressure on any elementary part of a cylinder tends to bend the cylinder as a whole, and not merely the part where the pressure is applied, we are led to the conclusion that the factor of "end resistance" may, in boilers of the marine type, equal or even greatly exceed the factor which we have hitherto treated as the sole factor in the case.

It is probable that further experiment and investigation may prove that a plate $\frac{3}{4}$ in. thick is quite sufficient for a purpose where we now think it necessary to use plates 1 9-16ths in. thick.

These experiments were designed to ascertain whether the factor, "end resistance," was one worth further consideration. The result of the tests is some answer to this question. The distribution of stress may, or may not, be accepted as satisfactory, but the fact remains that the strength of this model is absolutely incompatible with the truth of the "endless ring" theory; and unless anyone is prepared to say that a resistance which can balance a pressure of 270 lbs. is a negligible quantity in a structure designed to sustain a pressure of 100 lbs., he must admit that our present theory and practice require some modification.

The ingenuity expended in designing joints to have the maximum percentage of strength, the estimates of the strength of boiler shells based on exact calculations of the strength of their joints, appear simply ridiculous in the face of these experiments.

Theory.—The strength of boiler shells varies directly as the strength of their longitudinal joints.

Practice.—A shell plate having a joint strong enough to balance a pressure of $\frac{6}{10}$ lb. stood a pressure of 270 lbs. without serious strain except at the joint.

Since the before described experiments have been carried out, it has been suggested, that though the strength of an endless ring must necessarily vary directly as the strength of its joint or weakest part, yet when the ends are fixed, the deficiency of strength at the joint may be compensated by the end fastenings so that a ring of plates with a perfect joint or one with a joint of less than 100 per cent. of the solid, or with a joint of no strength as in the experiments before described, would all give practically the same strength, and that this strength would be the strength of the plate as an endless ring. Now, in order to clear this point up by a practical demonstration, Mr. Spence decided to make a further experiment which was carried out by Mr. J. P. Hall, at Messrs. John Penn & Sons' works, and gave very interesting results.

The model described was reduced to one-half of its original length, from 10 in. to 5 in., and again tested. Now if the strength of this shell depended on the strength of the plate, as an endless ring, it would be unaltered by this alteration in its length, but if its strength depended on the strength of the shell as a beam, it would be doubled by the shortening of the cylinder to one-half of its original length. Now the highest pressure at which we were able to get measurements in the 10 in. cylinder was 240 lbs.; at 270 lbs. the plate gave visible signs of straining, and leakage of the liner prevented the pressure being increased. With the 5 in. cylinder the highest pressure at which we obtained measurements was 480 lbs.; at 490 lbs. the plate was strained in the same way as before, and the liner was rendered useless. In experiments of this nature we cannot expect any great degree of exactness. And the pressure in the short cylinder was quite as nearly as expected to the double of that in the first.

On the face of it there seems no difficulty in understanding that the strength of a ring of plates should depend on the strength of these plates, and not on the strength of their joints, but when this proposition is examined critically it becomes impossible of belief as that the strength of a chain depends on the strength of the strongest, not its weakest, link. If a plate is held at one end and a load is applied to the other it will be in a state of tension, but if one end of it is free and a pull is given to the other, the plate will move in the direction of the pull, which will not produce tension but motion in the plate; a tension which is not balanced by an equal and opposite tension is an impossibility.

Now, in a continuous ring subject to pressure the tension at every point is balanced by an equal and opposite tension; but if the ring be divided longitudinally at any place the pressure would no longer be balanced, and there could no longer be any appreciable tension throughout the ring, and the only effect of internal pressure on it would be to open out the ring. No one would question this so far as regards a truly endless ring, and when we pass to the consideration of a ring with its ends fixed, the case does not seem very different. Let us consider the distribution of stress in the two cylinders, which, as endless rings, had practically no strength, but which stood a pressure of 240 lbs. and 480 lbs. respectively when the ends were fixed. These cylinders were each 10 in. in diameter and 1-16th in. thick; No. 1 was 10 in. long, No. 2 was 5 in. long. Now a uniform pressure of 240 lbs. on the shell would be balanced by a uniform circumferential stress throughout the shell of 240 × 5 = 1,200 lbs. per inch of length. If the plate had been continuous this would have only represented a stress of 1,200 × 16 = 19,200 lbs. to the square inch of section, which is well within the elastic limits of the material; but we know the plate was not continuous, and by itself was incapable of offering any appreciable resistance to this pressure, the only source of resistance being the end rings and the bolts that secured them. We therefore know that the resistance to tension was not uniformly distributed over the length of the cylinder, but was transmitted to the only possible source of resistance—the ends. The tensile stress per inch of length is 1,200 lbs., and the total stress over the whole length of cylinder is therefore 1,200 × 10 = 12,000 lbs. Are we to assume that the total stress of 1,200 lbs., instead of being distributed evenly over a length of 10 in., is balanced by a stress of 6,000 lbs. at each end of its length? That the whole of this pressure was concentrated at the ends cannot be doubted, but a stress of this magnitude acting at a point would, in the language of mathematics, be infinite in intensity. As this is an impossibility, we may consider that it was distributed over that part of the shell-plate which was gripped by the end rings; these were $1\frac{1}{4}$ in. wide, so that we have a tension of 9,000 lbs. distributed over a section of plate $1\frac{1}{4}$ in. wide and $\frac{1}{16}$ in. thick, this is at the rate of 76,800 lbs. per square inch of section, which is 35 per cent. greater than the ultimate resistance of the plate, and more than twice its elastic limit.

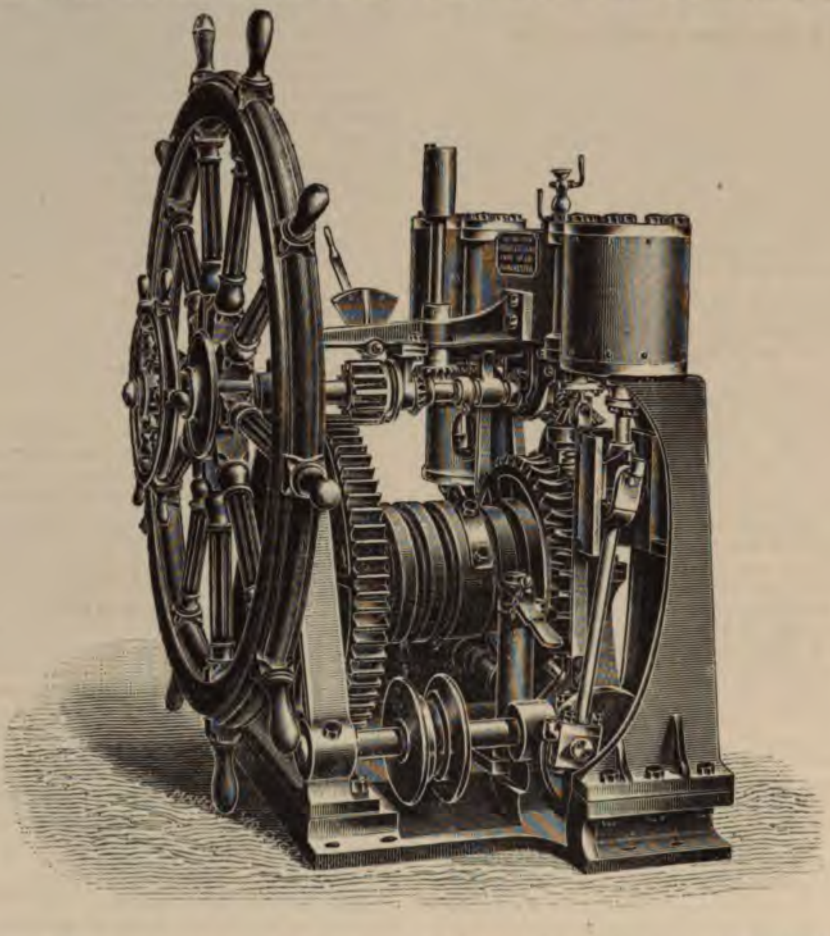
When we come to consider the matter in detail, it will be seen that the balancing of 480 lbs. on the cylinder 5 in. long on the theory of circumferential tension presents even greater difficulty than the previous case. To balance this pressure would require an evenly distributed circumferential tension at the rate of 38,400 lbs. per square inch of section. This is probably considerably above, and certainly cannot be much below, the elastic limit of the plate. Even if the plate had been perfectly continuous, instead of being completely severed, we should have expected the plate to be severely strained if exposed to circumferential tension to this extent. How, then, is it possible to believe that the plate which would be at or beyond its elastic limit if the tension were evenly distributed over 5 in. of width, could have the whole of this tension concentrated at a point, or even distributed over the rims, where it is held by the end joints?

It is also worth noting that the end bolts, which must have received the whole pressure from the shells of these cylinders, offer their full resistance to the stresses normal to the surface, whilst they offer no direct resistance to circumferential tension, which could primarily be only resisted by the friction between the ends of the shell and the end rings.

There are thus many serious, if not insuperable, difficulties involved in the theory that the pressure on these shells was transmitted to the ends by circumferential tensions.

If all of these difficulties could be surmounted or explained away, we have to meet this objection, which is absolutely fatal. Even if the resistance of the ends to circumferential tension was sufficient to resist the total pressure on the whole of the shell, still the resistance at the ends would not balance the pressure distributed over the whole surface of the shell. It is necessary for equilibrium that the stresses at every point of a surface exposed to pressure must be balanced by an equal and opposite resistance acting at the same point. A tensile stress of 100 lbs. acting at the centre of a length of a 10-in. cylinder can only be exactly balanced by a tensile resistance of the same amount acting in the same plane. A resistance of 50 lbs. at each end of the cylinder would not balance the stress of 100 lbs. at the centre, but would produce two unbalanced couples tending to twist the shell plate.

The conclusion is therefore arrived at that no part of the pressure on a cylinder which is balanced by circumferential tension can be transmitted to the ends, and conversely that no part of the pressure which is transmitted to the ends can be balanced by circumferential tension. If this is so—and hitherto this has been assumed as an axiom, hence the universal custom of estimating the strength of boilers by the strength of their longitudinal joints—then it follows that no appreciable part of the pressure on the shells of the 10-in. or the 5-in. cylinders was balanced by circumferential tension, and there is no other possible way in which these pressures could have been balanced except by a series of shearing stresses, increasing from nothing at the centre of the shell to a maximum value at each end. This distribution of stress completely satisfies the conditions of equilibrium. The pressure at every point is balanced by the resistance of the plate at that point. The stresses are not concentrated at two points, but distributed over the circumference of two circles: and this system involves no excessive stresses, a given amount of pressure being balanced by a series of shearing stresses, which are just one-fifth (in a cylinder 10 in. in diameter) of the tensile stresses that would be necessary to balance the same pressure.



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The Harrison Co. are also patentees of a special rudder connection, by the use of which the usual chain gear is dispensed with in normal use, and is only fitted as a "stand-by" in case of need. The action of the steam or hand gear is taken direct on to a tiller connected to the rudder-post by compression springs between the tiller and a quadrant head, being fixed to the rudder stock, and which is also fitted for the chain gear as a "stand-by." The steam gear operates the cross-head by nuts on right and left handed threads of the steering axle, so that the rudder is held absolutely firm by its cross-head against the shocks of heavy seas, and the whole gear is so simple and strong that there is little chance of breakage or failure.

NATAL HARBOUR ENTRANCE.

WHEN we last wrote on this subject six weeks ago, says a writer in *The Natal Mercury* of Saturday, April 4th, we gave an account of a somewhat remarkable performance of the new dredger *Octopus*, when in 14 hours she dredged a 13 ft. passage through the bar, which at the time was only 5 ft. below the water's surface at low water. We also stated that this fact alone was by no means sufficient to satisfy us that the principle of dredging on a large scale was necessarily the solution of this most difficult problem. It undoubtedly supplies strong evidence in favour of dredging, but something more than that is wanted before so vital a question is settled once and for all. We have, therefore, continued to watch results with sustained interest. The south channel has remained open since the dredger cut her way through the bar at the beginning of February, and has given minimum depths varying from 13 ft. to 19 ft. at low water. It may be said that during this time the *Octopus* has maintained a complete mastery over the bar, so much so that the bar itself during the past two months has not been so great an impediment as the shoals which exist inside between the two piers, where scour is supposed to be greatest. On several days the official record of depth of channel is not the depth on the bar, but the depth of the shallowest part of the channel a long way inside the bar. For instance, on the 14th March the depth given is 16½ ft., but the shallowest depth on the bar that day was 17¾ ft., the same circumstance occurred on several other days. It was found to be necessary to take the *Octopus* from her work for about ten days to effect certain repairs which were necessary, but before she was taken off she dredged to a considerable depth on the bar over a large area, the soundings showing depressions from 20 to 30 ft. below low water. On the 19th ultimo she was removed. It is needless to explain that Nature soon had something to say to a sandy sea-bed with holes dug out 10 ft. or 15 ft. deep in places. The natural effect soon began to be apparent, the holes filled up, but the general level thereby increased in depth till the greatest depth was reached on the 28th ultimo at 19 ft. on the bar, the inside shoal showing 18½ ft. Nothing can be more satisfactory than this experience as far as it goes. The south channel from being completely closed is opened up with a deep channel in a remarkably short space of time, and this depth is thoroughly well maintained, and although the dredger is removed for nearly a fortnight the good work that she has done is not obliterated by the time she returns. We have to remember, however, that although it may be impossible to lay down a rule as regards good and bad seasons, still this time of the year is generally favourable to good depths; nor do we believe it at all likely that the bar could be left alone for a fortnight at any time of the year without a chance of it shoaling up. Therefore, we say that, as far as they go, these recent experiences are eminently favourable; indeed, those most partial to the system of dredging could scarcely have looked for better results. It is as well to recognise, however, that it would be highly injudicious to place entire trust in one dredger. If we are to depend upon keeping the port open by means of dredging it will, of course, be absolutely necessary to be provided with two dredgers. It is true that in the meanwhile we have the *Beaver*, but the *Beaver* is not suitable, and does not perform the work that is required in so economical a manner as an *Octopus* would. There will, undoubtedly, be seasons when dredging operations on or near the bar will have to be more or less continuous, when the cessation from such work for a fortnight would cause the greatest possible inconvenience to the shipping and forwarding interests, and bring discredit on the port. It is, of course, hoped that one dredger such as the *Octopus* will be able to dredge a large area to a great depth, thereby preventing the formation of breakers in the channel at all, and so securing good depths over periods during which the dredger may not be able to work. No doubt the principle of thus forming a reservoir is to a certain extent practicable, as has been clearly shown during the past fortnight, but to depend upon this would be hazardous, nor do we consider that the *Octopus* has proved this to be generally practicable, undoubted as her success has been at this particular time.

Impediments exist in connection with the port to a serious extent. but the bar is not now the cause of it. The causes are want of depth of water inside the harbour, and want of wharfage accommodation. At the present time the greatest possible inconvenience is being felt in consequence of both these causes. Ships are lying three and four deep at the wharves, and large steamers are being kept in the roadstead and in the Bluff Channel because of the want of depth alongside the wharves. This question is one that should receive the earliest consideration of Parliament. It was always to a certain extent problematical whether this port would get a large excess of trade when railway communication with the Transvaal had been established, and it would have been unwise to have spent large sums of money on substantial works of this description without more accurate knowledge of what would be required to justify such action. We have, however, now sufficient proof of what will be wanted, and no time should be lost in voting the necessary supplies for the work. Unfortunately, the present staging is in such a condition as to require immediate attention. It is, in fact, of such character as to be unequal to the present requirements, and its re-construction will restrict the limited space now available. The country will certainly be justified in securing greater facilities for the trade of our port, costly as the necessary work will be; for there can be no doubt whatever that if facilities are offered, ships will come, and Port Natal will, in this respect, hold her own with other ports of South-East Africa. The dredger *Octopus* was constructed by William Simons & Co., Limited, Renfrew.

S.S. "MARIA RICKMERS" AND "ELLEN RICKMERS."

MESSRS. JOSEPH L. THOMPSON & SONS, Limited, of the North Sands Shipbuilding Yard, Sunderland, have just delivered two finely modelled steel screw steamers, the *Maria Rickmers* and *Ellen Rickmers*, to the order of Messrs. Rickmers Reismuhlen Rhederei & Schiffbau, A.G., Bremen, which are intended to run in the rice trade mainly between China and Bremen. We produce a plate showing the *Ellen Rickmers* steaming on trial.

The general description of the vessels is as follows: 427 ft. long, 50 ft. 6 in. wide and 30 ft. deep, moulded, and they are designed to carry a deadweight of over 7,200 tons with Lloyd's summer freeboard. They have been built under special survey to Lloyd's highest class, on the three-deck rules, and have a full poop, long bridge, and topgallant forecastle. The poop is arranged for cargo. The officers' and engineers' berths are on top of the bridge deck, and the passengers' state-rooms and saloon are placed in a house built on the fore part of the bridge deck. On top of this house is placed the chart and wheel houses. The crew are berthed in the topgallant forecastle. The vessels are built on the web-frame principle, with intercostal stringers right fore and aft. The upper and main decks are of steel, the poop, bridge, and forecastle decks being of wood. Special attention has been paid to the loading and discharging arrangements, nine derricks being fitted, six of which are of steel. Seven powerful steam winches are placed on deck at the hatches, and a patent steam windlass on the forecastle deck. The steam steering gear is placed at the after end of the engine-room, and is controlled by a wheel from the steering house on the bridge forward. All the auxiliary machinery is arranged to work at the full boiler pressure. A powerful screw gear is placed at the after end of the poop. Water ballast is carried in a cellular double bottom, right fore and aft, and in the after peak. The vessel is fore-and-aft schooner rigged, with pole masts. On the upper bridge deck amidships are placed four large boats, the two lifeboats being of seamless steel. The vessels have a graceful clipper stem finished off with a well carved figure head, and elaborate trail boards running away from this.

The engines for the *Maria Rickmers* have been supplied by Messrs. George Clark, Limited, Sunderland, and are of the following sizes:—27 in., 43 in., and 72 in., with a stroke of 48 in. Steam is supplied by four multitubular boilers, working at 180 lbs. pressure; and all the most modern improvements in propelling machinery are fitted.

The engines for the *Ellen Rickmers* have been supplied by Messrs. John Dickinson & Sons, Limited, Sunderland, and are of the same sizes as the above, but with three boilers only, in this vessel, Howden's system of forced draught having been adopted.

The vessels after running a most satisfactory trial, proceeded to their loading berths, and are now on their first voyage to the East.

The two vessels attracted a considerable amount of interest in shipbuilding circles while being finished at the works of the builders, and are notable additions to Messrs. Rickmers' well-known fleet.

THE FLEETS OF THE MAIL LINES.

(*From our own Correspondent.*)

An Atlantic Veteran.

PERHAPS the most interesting matter that has occurred in connection with the fleets this month has been the celebration of the bicentenary of Captain William Willegerod, the commander of the North German Lloyd Liner *Spree*, and Commodore of this famous line. Occasion was taken of his two-hundredth round trip to make him a presentation when he reached Southampton on the eastward voyage. Two hundred round trips mean not far short of a million and a half of miles, and it has taken the captain over a quarter of a century to compile. Yet he insists that we must remember that is by no means the limit of the distance he has traversed. It is only what he has done since he first obtained a command in the line. The actual number of crossings has not transpired, and might be difficult to obtain exactly. The captain is not an old man, having been born as recently as 1839, and thus being under fifty-seven years of age. In 1855 he went to sea in a sailing ship, and remained in sail till he got his first command eleven years later, when he was twenty-seven. Two years later he entered the present service, and in 1871 he was in command of the company's s.s. *Weser*. This was then an important ship, she being then only three years old, and of a gross tonnage of something like three thousand. A year later he distinguished himself by the rescue of a British crew from a sinking steamer—an experience which he has at intervals repeated throughout his long career. The most recent remember is the rescue of the passengers and crew of the ill-ted *Abyssinia*, when that steamer was burnt in mid-Atlantic. hat since he got his present ship. Other crews and other vessels various nationalities have in the interval had to thank him for services rendered, and I need not dwell on them. When the North German Lloyd Company determined to start their express service, Captain Willegerod had the first vessel then built. This was the unlucky *Elbe*, and since that time he has had most of the new vessels as they came out. The *Spree* has been the vessel which has, perhaps, brought him nearest to serious disaster, and that through no fault of his. We all remember her breaking her shaft and holing herself aft some two or three years ago when she was towed into Queenstown with the water over the intermediate saloon floor, and the difficulty that Haulbowline Dockyard found in dealing with so long a craft. Since then, when in charge of a pilot, the vessel has made acquaintance with the coast of the Isle of Wight, and on both these occasions the captain has not only had the satisfaction of averting all loss of life, but has had his exertions rewarded by seeing them successful in the saving of all the property committed to his charge.

The Trooping Season

is to commence, as far as the engagement of transports is concerned, on the last day of August this year, and the Director of Transports has issued his notice of what the Government require. They again ask for four five-thousand-ton ships fitted with the electric light. The five-thousand-ton limit is only a minimum, larger vessels will be accepted. But all candidates must have made at least one voyage in a first-class passenger line. The minimum speed is to be thirteen and a half knots. The engagement is for six months certain, and is thus practically what it has been during the last two seasons. This is a little surprising, as hitherto the reliefs have required five troopships. There have been four hired merchantmen, and the *Malabar*, last of the Indian troopships. We have been repeatedly told that the recently concluded trooping season was to be the *Malabar's* last, and that the Home Government was buying her for very different duties. Possibly we shall hear soon that another hired trooper is wanted, for it will be impossible to get the four ships now engaged round quick enough to enable them to do the work of five.

The Dominion Line

has shown the energy which an infusion of new blood brings by the launch, at the Queen's Island yard, of the big steamship *Canada* for their mail service between Liverpool and Moville and the S. Lawrence. This vessel is notable for several reasons. She is the first twin-screw boat built for the trade, though the Dominion Line has had several under charter, and is the biggest vessel yet regularly employed in the S. Lawrence. Her gross tonnage approaches 9,000 tons, and she is in every way worthy to displace the *Labrador* as commodore ship on the route.

She is, of course, built in view of the threatened Mail Line with its great speed and its heavy subsidy. As yet the older Allan Line gives no sign of its intentions. We shall, however, await with great interest the publication of the results of the tenders for the new service, which are now definitely invited. They will be received up till the 10th of June, and the period over which a weekly service is to be maintained is to be ten years. The speed is to be 20 knots and the vessels, of which there must be four, must be not less than 8,500 tons gross register. The service is to commence in less than two years, the date named being the 1st of May, 1898. There is one point in the contract which has caused a judicious silence to be maintained in regard to it. It is the choice of terminal ports. Liverpool is to be the British terminus, as is geographically correct. Whatever claims Southampton may have on the New York service she can have none for the North-about-Ireland Canadian lines. Her disappointment keeps her quiet. She has actually lost the Hamburg Line on the homeward trip and she set her heart on getting the Canadians. Having missed it she is silent, and Liverpool is too big to trample on her. Southampton, on the other hand, scores off Plymouth by the omission of the homeward Union Liner's call at the Devonshire port.

Liverpool Improvements

go on apace. The arrangements for extending the landing stage and building the jetty were very skilfully laid, and the new section of landing stage required by the scheme was put in position on the 5th of May. How the giving of facilities breeds traffic has been very forcibly illustrated in the recent history of Liverpool, for it is not twelve months ago that a high North-Western official told me that they, having the Waterloo Goods Tunnel, had thought it worth while to adapt it for passenger traffic, but that the expected benefit from the opening would certainly not have justified them in going to any great expense in giving travellers by the old route train-to-boat facilities. Now they find that they do as much work by the riverside station and route in a day as they anticipated doing in a week, and that not saloon passengers alone but steerage have become their customers. They are now able to compete very successfully with Continental lines for the North of Europe traffic, running specials from the boat-side to make connection at Hull with the German Ocean steamers. This is an express route for such travellers, as the time between New York and Gothenburg has been reduced to about eight days. The period of transit between Euston and the Riverside station has been diminished 20 per cent. during the year and now stands at four hours. Meanwhile the Dock Board has been improving the berth at the stage, and vessels care no more for the state of the tide there than they do for the depth of the water where the bar used to be. The influence of tide on the convenience of passengers at Liverpool has, in fact, ceased once and for ever.

Trips to the Welsh Coast

have ever been the favourite pastime of the people of South West Lancashire as those to Margate and down the Clyde have been those of Londoners and Glasgow people respectively. The vessels used in the Liverpool and Llandudno service had been allowed, however, to get somewhat behind the times. Now all that is changed. The old vessel *Prince Arthur* and the later *Bonnie Princess*, have been got rid of, and the modern *S. Tudno* was put on the route some four years ago. Now she is being given a companion in the *S. Elvies*, like her, a steel paddle steamer from the Fairfield yard. The engines are of the compound diagonal type to which Fairfield is somewhat addicted when it has to combine speed and slight draft in paddle-boats. The advent of this vessel will give the owners opportunity to make two sailings a day. That in the morning from Liverpool will enable excursionists, who can devote a whole day to pleasure, to spend a long day on the Welsh coast, returning the same evening. The afternoon sailing will appeal more to the business man who cannot afford to give up a day's work. Leaving after banking hours he can make his voyage, and, if he desires it, return the same night by sea. If he does not object to an early start he can spend the night in the fresh Welsh air and be back in good time for the next day's business.

New York Harbour Facilities

are giving those interested in the city's trade some little cause for discussion and suggestion. Several matters have tended to bring the question into prominence. The American-owned Atlantic liners have recently been put both to delay and expense by groundings at the entrance to the harbour, and it is considered that the passage from the narrows to the sea should be dredged to a minimum depth of 35 ft. to prevent all risk of delay and possible injury. The estimate for this work is half-a-million dollars, not a vast sum to be spent on so good a work, and on that question there can be little divergence of opinion. The other matter is not so easily dealt with. It is the question of wharf and dock facilities within the port itself. That seems to bristle with difficulties. The statistics show that there are large numbers of ocean companies which are able and willing to pay large rents for wharves and cannot get them. Many of them have to be content with docks in Hoboken, Brooklyn and Jersey City. Then, too, the state of the wharves that exist is not what such tenants have a fair right to expect. They are many of them old-fashioned and dilapidated. Yet they are good investments to the city. The annual rent paid for them often amounts to as much as their original cost, whilst the tenant has to put up valuable sheds upon them at his own expense, and those revert to the city at the expiration of the lease. Yet the dog-in-the-manger policy of the city authorities, whilst it has killed private enterprise in the wharf-owning business, has not had the energy to develop a hundred per cent. investment of which it has attained a practical monopoly. For barely one-third of the frontage that might be made use of for docks has been taken. The excuse for this supineness is that there are no funds available to the city for the development of the business. But this is an excuse which will not hold water. Any little place can get money on bonds to develop its trade for the asking. Not only is New York rich enough to borrow money for any purpose whatever, on very low terms, but it has here the additional argument of experience. It can show that the money will go to developing what has proved so lucrative an undertaking, and the money difficulty cannot be the true reason. Lastly comes the suggestion that the city should embark on the business of dry-docking, and build an 800 ft. dock. There is no dry dock, it is true, at New York which would take the very largest ships now afloat, but there are plenty of dry docks capable of dealing with any but the largest ocean steamers, and there are bigger docks near by. If the city goes into the dry dock business it will kill private enterprise in that direction as it has destroyed it in the wharfage business. It seems open to question whether the move should be made towards building a large dry dock with public money when private enterprise has hitherto in this direction afforded every needful facility. A municipality ought to keep out of commerce as far as is practicable. Let New York look at Manchester, and see whither her finances tended when she once began a commercial business like dock-owning. One would imagine that the erection of a separate trust like the Mersey Dock Board for the port of New York would be a wise and easy solution of the difficulty.

The Straits of Belle Isle

have recently proved even more fatal to steamers than has been their wont in previous years. My readers will remember the loss of the fine twin-screw steamer *Mariposa* at Forteau Point, at the entrance to the straits in September last. She was a big steel vessel of over 5,000 tons gross register, built on the Tyne, and only four years old at the time of her loss. I have recently received a photograph from a correspondent at S. John's, Newfoundland, which shows the wreck and its surroundings, and explains several of the statements made in connection with the disaster. It was said that there would be a prospect of getting the vessel afloat this season, and many weeks after the stranding she was reported as "being in splendid condition." The picture shows her lying alongside the rocky cliffs as if off a dock wall, and almost on an even keel, with a very slight list to starboard, that is, away from the land. A closer inspection of the photo, however, shows that she was somewhat up by the bows and down by the stern, but her great length minimises this. No sign of straining can be observed, and her masts seem well in line,—a thing greatly to her builders' credit. Since the photo was taken my correspondent tells me she has parted aft of the engine-room and become a total wreck.

The Russian Volunteer Fleet

is a wonderful organisation, and one that does not meet with sufficient recognition amongst the general public in these islands. It is a very military and formidable fleet, and is much more likely to be offensive than the fleet of auxiliary cruisers, which form the British equivalent. For though I should be the last to minimise the value either of the splendid body of officers and men who form our small Royal Naval Reserve, or to disparage the fine ships they man, yet the distinction between the two fleets is that the Russian vessels are designed for war and temporarily adapted to the uses of peace, whilst the British steamers are primarily designed for the special services in which their owners require them, though care has been taken to make them as far as possible available for war purposes should necessity unfortunately arise. That the distinction I have drawn is an important and real one is shown by the fact that on the Atlantic, where our finest auxiliaries trade, French, Germans and Americans have ships of much the same type. But the Russians stand absolutely alone in running vessels of the *Kherson* type to the north of the latitude of Japan. This vessel, the *Kherson*, was built on the Tyne this year, and sent on her trial in May. She is a vessel only 7 ft. shorter than the *Umbria* of the Cunard Line, and her speed and H.P. do not fall far short of hers. The contract speed is 19·5 knots on trial. The *Umbria* would average that speed at sea. The vessel is fitted with Belleville boilers of the type now adopted for the first-class cruisers of the British Navy, and they are adapted to a working pressure of 250 lbs. This fact will give her performances an interest to shipowners and marine engineers. But it is evident that there is more patriotism than commerce in the company which turns out vessels of this type for a trade like that to Vladiovostock, where speed is not required and where competition is unknown.

The Transfer of British Ships to Foreign Flags.

has interested *Fairplay* during the month of May and has even attracted the attention of the *Times*. Statistics are put forward not only by *Fairplay* but also by the secretary of the Hartlepool shipowners' society, to show that British ships are being sold abroad in increasing quantities. The Hartlepool official says that the port's ships sold are those of the single-deck type and date from the years 1880 to 1884. It might be possible to argue that the average age at which an English shipowner considers a steamer worn out for his trade is from twelve to sixteen years, and that at the moment we are striking the remains of a period of heavy building following one at the end of the seventies of comparatively light building, and that therefore there is nothing abnormal in present conditions. But it is not necessary to do that. We see at once that vessels built in the period included between the two years named were of the old compound-engined type and were probably iron-built, as steel had not at that time come into general use, especially for small steamers of the class under discussion. It would seem to me that the Hartlepool shipowners have found that these older vessels, though they stand almost written off in the books, are such small carriers in proportion to their registered tonnage and are so extravagant in coal and in repairs, that they had better get what they can for them and buy new ones. They are no doubt strengthened in this course of action by finding that the tendency of the present day is to build larger vessels which carry far greater cargoes with very light increase in running expenses. They have sold these vessels to foreign owners who think because they have got them cheap, and got cheap labour to run them with, they can make a profit with them where an Englishman fails to do so. This sounds like a fair speculation. We may see it urged on the one side that the saving of capital expenditure and of depreciation and interest and insurance will more than make up for limited earning power and for high expense of working. We may hear on the other that a thing which has lost its capacity for earning money and has simply become a sink for expenses is dear at a gift. We shall see which of these two views is nearest the truth. If the foreigner is wise in buying the old ships he will continue in the trade. If he has made a mistake he will lose his money. But till we hear some of the results of his trading we cannot possibly arrive at any conclusion as to whether the Hartlepool people were well rid of a bad bargain or not. They at all events got 4 or 5 pounds a ton for shipping that to break up was worth scarcely a pound, and, so far, they have the best of the bargain and can hardly ask for sympathy.

The Royal Naval Reserve.

I spoke a few paragraphs back in praise of the Royal Naval Reserve, and I speak not as one that is entirely ignorant of the force. Only last week I had the pleasure of going down to Plumstead Marshes and seeing officers and men at rifle and pistol practice. There is no doubt about it that the force is a valuable and enthusiastic one, and that the men, coming as they do largely from liners, are well disciplined, and worthy of the traditions of the British Merchant Navy. The only trouble about the matter is that the force is much too small, and that what there is of it would not be available for the expansion of the personnel of the Navy in war-time, without the undue crippling of the ships that would be most necessary to us. If we have the command of the sea—as we profess to have, and as we admit, is vital to our national existence—we must not let any war, however important, hinder our oversea trade. Indeed, we could not afford to do so to any very large extent, because we are so dependent on our commerce for food supplies, and for carriage of raw material and manufactured goods in connection with the vast factories of Lancashire and Yorkshire. If these men cannot be taken out of the liners we must arrange some means of increasing the Royal Naval Reserve, and that largely, from other sources. This is perfectly feasible, though it may cost the nation some money. We can increase the Reserve by getting recruits for it from the fishing population, and we must have the old apprenticeship system back again in some form or other. It must, of course, be altered and adapted to modern ideas, and will have to be aided by the State. Then, too, there is no doubt that in the engineering part of the Reserve there is a lamentable deficiency. It is not fair, nowadays, to ask men to make pecuniary sacrifices as well as risk their lives for the defence of the country. The country is well able to save its defenders from pecuniary loss. Sufficient inducement must also be offered to engineers to lead them to join the force in far larger numbers than they yet have done.

A Curious Arrangement,

which should not escape the notice of those who follow the composition of the fleets of the Mail Lines, was published at the recent annual meeting by the chairman of the Shaw, Savill, and Albion Company, which, as readers are well aware, runs a monthly service of mail steamers between England and New Zealand in conjunction with the White Star Line. That is to say the Shaw, Savill, and Albion Company was owner of two vessels on the route, the *Arawa* and the *Tainui*, whilst Messrs. Ismay, Imrie & Co. were owners of the *Ionic*, *Doric* and *Coptic*, which completed the necessary fleet. Various alterations have recently been made in the composition of this fleet of five boats. The twin-screw liner *Gothic*, the largest vessel in the Australasian trade, having been substituted for a smaller and older sister by the White Star people, whilst their friends have put on the *Aotea*. It is with regard to this last ship that the announcement I would draw attention to was published. It was stated that half a share in the *Aotea* had been transferred to the White Star people, who in return would give her owners half a share in a new vessel of the *Gothic* type now building at Belfast. As many readers are interested in the White Star Fleet, I may as well give some particulars of the vessel they have just half acquired. She was launched as recently as November, 1894, and is a single-screw steel-built steamer built by Messrs. C. S. Swan & Hunter, of Wallsend. Her length over all is 445 ft., and she is 49 ft. beam. She is classed at Lloyd's, and has six bulkheads. Her triple-expansion engines are from the Central Marine Engine Works at Hartlepool, the cylinders being respectively 30 in., 47½ in., and 80 in. diam., whilst the stroke is 48 in. The boilers are fitted with Howden's forced draught. The refrigerating machinery on such a vessel is almost as important as her propelling engines, seeing that she is fitted to carry one hundred thousand carcases of frozen mutton besides her other cargo. This big installation was by the Haslam Foundry Company, Limited. There is some accommodation for passengers, and it may be said that in these large cargo vessels the truth of the old adage, "The more the merrier, but the fewer the better fare" is well exemplified.

The Atlantic Transport Company,

though its owners have recently acquired the National Line steamers, does not seem to be exactly extending its business. It has the London-New York Line in which it employs the finest of its fleet, and for the development of which it felt it worth while to take on the National Line business, and it also has lines to Baltimore and to Philadelphia, as well as between Baltimore and many European ports besides London. Five steamers were employed on the Philadelphia route, and it was announced recently that these were to be withdrawn on account of poor business. It has since been notified that in consequence of urgent representations of those in the trade, the intention to withdraw will not be persisted in, yet it is plain that things are not flourishing there.

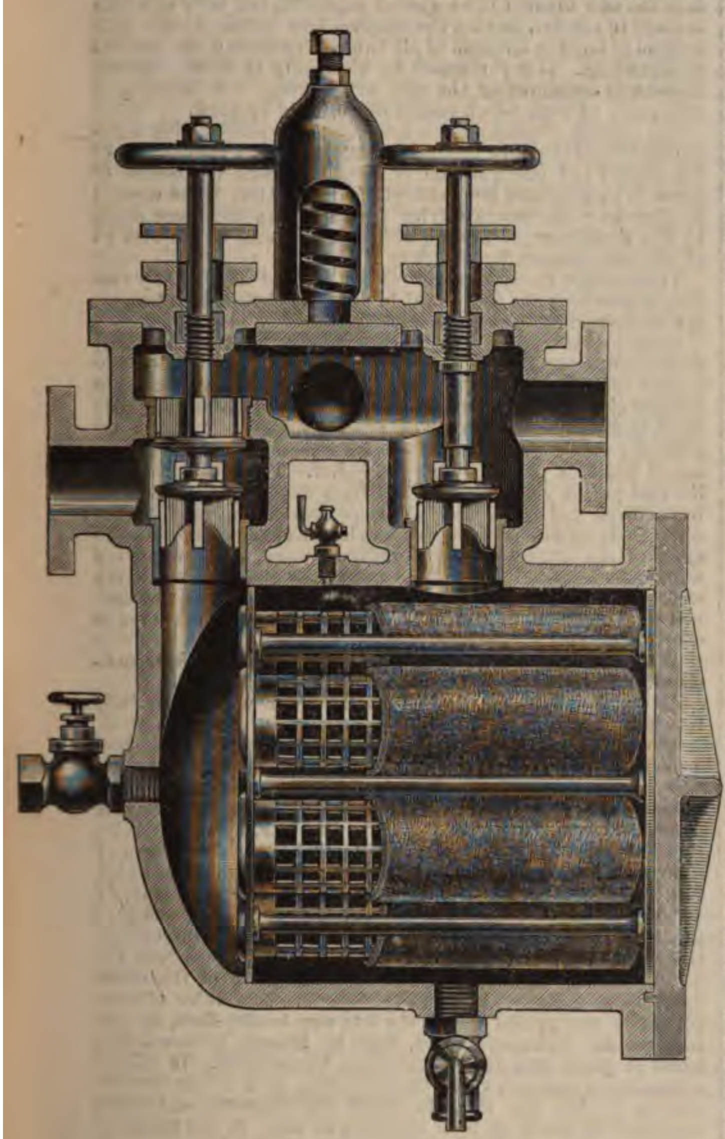
RANKINE'S PATENT MARINE FILTER.

THE filtration of feed water for marine boilers is now so well recognised a necessity that many makers are vying with one another to produce an apparatus which will give the largest possible filtering area in the smallest space, and which shall be readily accessible for renewals and cleaning, and otherwise adapted to the requirements of its position.

Amongst the many filters for marine purposes that have been before us, the one we now illustrate, made by Mr. David A. Rankine, 11, Oriel Chambers, Water Street, Liverpool, and adopted, as we understand, by the British Admiralty for the new 30-knot destroyers, and by the Dutch, Chilian, and Japanese navies, as also in the City of Dublin mail-boats and in the London & North Western Railway Co.'s boats, is well worthy of attention, as very neat and compact in form, and admirably fulfilling the above requirements.

Care has been taken to ensure an equal distribution of pressure over the filtering surface and that the filtering surface on the many cartridge gratings shall be so greatly in excess of the stream of water dealt with, which are both the first essentials for perfect and satisfactory filtration. The combination also of the bye-pass and outlet valve on one spindle is very neat and ensures that when the filter is closed, the bye-pass is open, so that there shall be no obstruction to the feed, and also that when the filter is open the bye-pass shall be closed.

It will be seen from the illustration that this apparatus consists of a cylindrical filtering chamber, having an inlet and outlet lying laterally; the valve chest being cast on to the main structure, and united in the upper part of the chest by means of a passage forming a bye-pass. Three valves are also fitted—inlet, outlet, and bye-pass. The outlet and bye-pass valves are on one spindle, so that when the valve is shut on the filter, it is open on the bye-pass. It is also mounted with a safety or relief valve to prevent any excess of pressure on the filtering material; and fitted also with a drain cock and steam blow-through valve, so that it can be cleaned by blowing through at any time, if necessary.



The filtering arrangement is a gun-metal casing, turned at the outlet end to fit the internal diameter of the filtering chamber; and at the other end to fit a recess in the mouth of the filter. It is then bored out to receive the cartridges so that they can be received or withdrawn without any difficulty. Seven of the cartridges are fitted into each casing, making one entire multiple cartridge proper. Each smaller cartridge consists of a gun-metal cylindrical grating, having an annular collar at the end next to the cover. The filtering material is drawn over each cartridge like a stocking, right up to the collar and secured by steel clips. This done the cartridges are then ready for fitting into place. In fitting these cartridges in their place, each cartridge is passed through the casing, and received at the outlet end in a recess, while the other end fits into the spectacle eyes of the casing next to the cover. A spare multiple cartridge is always supplied with each filter, and can always be kept ready for renewing the one in use.

The great advantage of a filter of this class is that it not only has an immense filtering area, but when it is for very large power, each part can be withdrawn, without any excess of weight, being light to handle; and the operation of overhauling can be performed in a few minutes.

ENGINES OF THE S.S. "INCHMONA."

We have pleasure in giving a plate illustration in this number of the five-cylinder four-stage expansion engines of the s.s. *Inchmona*, which has been built by Messrs. William Gray & Co., Limited, of West Hartlepool, to the order of Messrs. Hamilton, Fraser & Co., of Liverpool. These engines with their boilers have been built at the Central Engine Works, West Hartlepool, according to the designs and under the superintendence of Mr. Mudd. The main object in the design of these engines was that by a combination of modified devices as a whole, the consumption of coal could be materially reduced even to the extent of as much as 25 per cent. of the best performance previously obtained.

In the first place the boilers carry a steam pressure of 255 lbs. per square inch; secondly, combined with a system of induced draught was an arrangement of tubular superheater for drying and slightly superheating the steam on its way to the engines; thirdly, the steam is further kept in a drier state than usual throughout its progress through the engines by an exceptionally complete system of steam jacketing; fourthly, the feed-water is heated and returned to the boilers at about 400 degs. Fahr. by a system of feed-heaters; and fifthly, the novel arrangement of the five cylinders, each having a separate crank, whereby the mechanical efficiency of the whole engine is considerably improved.

The cylinders are 17 in., 24 in., 34 in., 42 in. and 42 in. in diameter, the low pressure cylinders being the last two. By this special arrangement it is found possible to balance the masses in motion by each other, thereby reducing the high initial strains in the engines and lessening the creation of vibration, and in this way saving a great deal of energy that is usually dissipated in vibrating the hull of the ship. The five cranks are set at equal angles around the shaft, so that the propeller receives no less than ten impulses per revolution, which are delivered at equal and regular intervals of time—a matter of great importance—the turning moment being much more equal than in other types of engines.

A three-crank engine at 60 revolutions per minute gives 360 impulses per minute, whilst a five-crank engine running at 80 revolutions per minute gives 800 impulses per minute, or more than twice as many as the three-crank engine. The stroke of the engines are 42 in. and the 80 revolutions per minute is not considered a high speed, as at the trial they ran exceptionally smoothly at over 100 revolutions, there being no vibration of the ship whatever, although she was entirely without cargo. The five-crank system does not, as it may be supposed, involve any great increase in length of engine-room space, as the reduced diameter of the cylinders allows the centres to be closer, and as an actual fact in this ship the engine-room is only one frame longer than for the same power in three-crank engines. On the trials, which extended over two days, the average consumption of coal was 1·07 lbs. per H.P. per hour, the lowest record being the phenomenal one of 999 lbs. per H.P. per hour. If the predictions of the builders are realized it will mean that some 500 or 600 tons of coal can be saved on the single round voyage to Australia or New Zealand of a cargo boat carrying 6,000 or 7,000 tons at a speed of 11 knots per hour. It is now a matter of interest to ascertain from the results in the future whether the increased cost of machinery will produce such a result as to ensure the investment of such increased expenditure being a commercial success.

LAUNCH OF AN ARMOUR-PLATED TORPEDO-BOAT DESTROYER FOR THE ARGENTINE GOVERNMENT.

On Saturday afternoon, the 15th of May, we had the opportunity of being present at the launch of one of the torpedo-boat destroyers for the Argentine Government, at the works of Messrs. Yarrow & Co., Poplar.

Nothing better could have been desired in the way of weather, and as the arrangements for the entertainment and comfort of the visitors was perfect, a very enjoyable afternoon was spent, quite apart from the extremely interesting nature of the many things to be seen in the yard, which formed an intellectual treat to many who had not had the opportunity of inspecting the works on any former occasion. On arrival at the works at two o'clock the visitors were conducted on board a stern-wheel steamer which was on the stocks nearly completed, and were regaled with a sumptuous lunch. After the lunch the visitors were conducted round the works. Among the variety of work being carried out at the Poplar establishment the construction of water-tube boilers was of more than usual interest, especially at the present time when such radical changes in boiler design are taking place.

The Yarrow boiler, it will be remembered, has straight tubes, in which it differs from all others of what is termed the "Express" type. Not only do straight tubes lend themselves to a very simple and inexpensive form of construction, but the advantage of adopting them is evident to every practical engineer, as the tubes can be cleaned and examined internally with much greater facility than in the case of boilers with tubes curved to a variety of ingenious shapes, which, for vessels destined for lengthened service at sea, is of the first importance, especially, as at times of emergency, or leaky condensers, salt water may find its way into the boilers.

Long experience has shown that they develop large powers with a low air-pressure and are economical in fuel.

The boilers which were in the course of construction were those for the Argentine torpedo-boat destroyers. Each of these boilers weigh, filled with water, and including all fittings, 6$\frac{3}{4}$ tons, and they are intended to develop a minimum of 700 H.P. each.

A feature of novelty in the construction of these boilers is the method by which the tubes are expanded, which up till now has been done by hand with an ordinary percussion expander. The firm has now brought out a special expander, the body of which is made to revolve, leaving the mandrel free to feed itself. This method of feeding disposes of all hammering during the process of expanding. It is performed by electricity or steam, thereby immensely accelerating the rate of progress and insuring a uniformity of work which cannot be obtained by hand.

The method adopted was to connect the expander with some source of motive power through a flexible shaft, which allows of the ready hand manipulation of the tool, while the source of power is external and independent of the operator. When worked by electricity the motors driving the expanders are those made by Mr. Kodolitsch, of Trieste, which motor seems to conform to all the requirements for this class of work.

Visitors were shown the very simple method adopted by the firm in renewing the tubes, which, owing to their being straight, can be carried out with great facility.

While on the subject of water-tube boilers, it should be noticed that this firm regulates the water level automatically without any special feed floats or other gear, which is mostly of a very delicate character, and being generally enclosed within the boiler itself, is difficult of access. The method adopted is simply by adjusting the level of the internal steam pipe to the feed engine, one of which is provided to each boiler. The steam working the feed pumps can thus be taken from any desired height of water level, and when the water rises above the steam inlet the water finds its way into the steam cylinder of the pump, and the speed of the latter is thus materially reduced, while, when the water falls below the level of the orifice, the pump at once works with rapidity, forcing water into the boiler. By this arrangement an automatic system of maintaining a uniform level is obtained by very simple means.

This arrangement was shown successfully at work in a second-class torpedo boat developing about 250 H.P.

At 3.40 p.m. the torpedo-boat destroyer was successfully launched.

The firm have in hand four of these large torpedo-boat destroyers for the Argentine Government. These vessels are 190 ft. in length by 19 ft. 6 in. beam by 12 ft. deep, and are propelled by two sets of triple-expansion engines, having cylinders 18 in., 26 in., and 39$\frac{1}{2}$ in. in diameter, by 18 in. stroke, intended to indicate about 4,000 H.P. There are six boilers of the Yarrow type, each having the method of feed regulation, which has just been introduced by this firm. The special feature of these destroyers is that they are partially armoured, and thus protected against the smaller class of projectiles throughout the entire length of the machinery space, so as to reduce the risk of damage in time of action to those parts of the vessel upon which its speed and utility depend. The value of such protection was proved during the late war in the East, by the torpedo-boat destroyer *Kataka*, built by Messrs. Yarrow & Co., about 11 years ago, for the Japanese Government. It will be remembered that this vessel took a leading part in the torpedo attacks during the war, in which the Japanese authorities surprised the world by their successes at sea. It was found by actual experience that the partial armour of the Japanese boat materially reduced the damage done, as compared with other torpedo-boats which were not so protected.

The armament of the Argentine boats will, as usual, consist of torpedo tubes and quick-firing guns.

The Argentine torpedo-boat destroyers are being constructed under the direct superintendence of Captain Adolfo M. Diaz, chief of the Argentine Naval Commission, Lieutenant J. T. Peffabet, and Mr. T. W. R. Hughes, inspecting engineer to the Argentine Government.

The large stern-wheeler upon which the visitors were entertained had steam up and the engines were worked the whole afternoon at their full speed, which gave a good opportunity of showing how little vibration was caused in the boat during their working.

This steamer has been built for the Russian Government for the use of the Trans-Siberian Railway Co. This class of vessel was first introduced into this country, in its present improved form, by Messrs. Yarrow & Co., and is one of the principal specialities of the firm. It is, however, interesting to know that the first steamer that was ever built was on the stern-wheel principle. This class of vessel, as is well known, is specially adapted where extremely shallow draught is essential, as by the trussing adopted longitudinal strength is obtained with the minimum amount of weight, and thus light draught is secured. The vessel in question will be shipped very shortly to Vladivostock in pieces, from whence it will be transported into the interior of Siberia and there put together. It is constructed of mild steel, galvanized, and will draw about 12 in., and have a speed of about 12 miles. Messrs. Yarrow & Co. have constructed a large number of this class of steamer for all parts of the world, some of them having a draught not exceeding 10 in. The main deck is flush, and upon this is usually placed the cargo. There is an upper deck upon which is situated the cabin accommodation.

The Trans-Siberian Railway is a work of great magnitude, and the rapidity with which it is being constructed compares favourably with what has been done in the past in the United States and Canada. It may be interesting to note that the line extending in an easterly direction from St. Petersburg is at the present time finished as far as Krasnoiarsk, and will very shortly be opened to Irkutsk. The eastern extremity of the line is at Vladivostock, and is completed from that port in a westerly direction as far as Khabarovka, on the Amoor river. The extent of the line actually opened at the present time is about two-thirds the total distance, and it is confidently expected that direct railway communication between St. Petersburg and the Pacific will be effected in the year 1900, and doubtless, when finished, it will have considerable political importance.

Two stern-wheel gunboats have lately been shipped by Messrs. Yarrow & Co. for the Portuguese Government for service at Lorenco Marques. One of these was built in floatable sections, which system was adopted by this firm 13 years ago in a similar vessel constructed for the navigation of the Congo for the use of Mr. Stanley. Similar vessels have been built for the British Government for the Nile Expedition, and for service on the Zambesi, and it was regretted that the firm were unable, through press of work, to tender for similar vessels required at the present time for service on the Nile.

A smart little twin-screw gunboat, with compound engines, is being constructed for the Brazilian Government. This boat is about 90 ft. in length, and will have a speed of about 12 knots.

Six first-class torpedo boats for the Chilian Navy are also in hand. These are 152 ft. 6 in. in length, by 15 ft. 3 in. beam, and are propelled by triple-expansion engines, and have a guaranteed speed of $25\frac{1}{2}$ knots. The bunker capacity is 40 tons, which will give a very large range of action. The indicated power will be about 2,000, and they will be an improvement on the *Viper*—which vessel was lately built at these works for the Austrian Navy. This vessel, it will be remembered, attained a speed for three hours—carrying 26 tons—of 26·6 knots, with a consumption of 1·9 lbs. of Welsh coal per I.H.P. per hour, with an air pressure of $\frac{7}{8}$ of an inch in the stokehold.

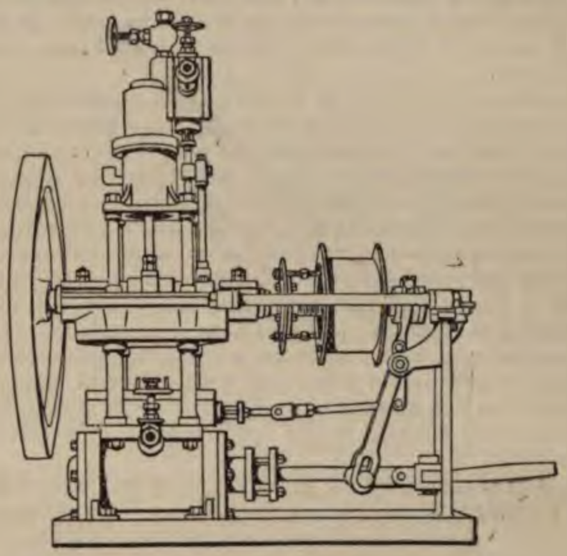
The armament of the Chilian vessels will consist of torpedo tubes and quick-firing guns as usual.

About eleven hundred men are at present employed by the firm, and it will be seen, from the state of the yard, that there is not a single foot of ground to spare.

KEATS' MARINE ENGINE GOVERNOR.

THE last decade has seen many systems suggested and carried into effect for governing or controlling the speed of marine engines, especially at those times and under those circumstances when the load is suddenly removed and applied again by the propeller being intermittently in and out of the water. We have had governors controlled by the head of the water at the stern of the vessel; by the momentum of a moving mass and its disinclination to suddenly change its rate or direction of motion; and by the working of the main valves of the main engines by a separate auxiliary engine, so that the main engines cannot revolve any faster than the main valves are operated by the auxiliary engine. The main objections to the two first mentioned systems are that they do not anticipate the reduction of load, in consequence of the fact that there must be a marked increase in speed to put them into action, consequently they are only partially effective. The objection to the third system is that as the main valves are not controlled by the main engines, the advantages of lead, cut-off, and compression are done away with, and very heavy strains are thrown on the operative gear of the main engine.

It must be remembered that a governor not only prevents the engine wrecking itself, but prevents priming and unnecessary wear and tear, as well as saving both fuel and time. It is a well-known fact, that, when the weather is bad and the engines have to be governed by the engineer standing at the throttle valve, the progress of the ship is often *nil* and the steam consumption is high; whereas, if the engines are automatically governed they keep on at a steady rate, the ship progresses, and much less steam is consumed, due to the absence of the waste of energy that obtains when racing takes place.



We have pleasure in bringing before our readers a marine engine governor which is of an entirely different class to those already described. This governor has been invented and patented by Mr. R. Keats, of 9, Garnier Street, Fratton, Portsmouth. We illustrate the device in the adjoining diagram, from which it will be seen that it consists of a small vertical inverted engine with a fly wheel, which is adapted to work at a constant speed. The crank shaft is connected directly to the shaft upon which a screw of very coarse pitch is arranged, and which is therefore revolved at the same speed as the crank shaft. Upon the screw is fitted a pulley wheel with its boss arranged as a nut, and this pulley nut wheel is driven by the engine to be governed, by means of a belt, at the same speed that the small engine drives the screw. The rates of revolution between the auxiliary engine and the main engine is 8 to 1. The nut wheel is adapted to operate a lever which is connected to the slide valve of a small steam cylinder fitted with a piston and piston rod, which is directly connected with the throttle valve gear of the main engines. This lever is pivoted at the end of another lever operated by the piston, which one may term a "hunting" lever, as it is so adjusted that when the piston has travelled the distance required by the travel of the nut wheel on the screw, it closes the slide valve of the small cylinder again. When this governor is connected with the main engines and the latter are travelling at their required speed, the screw and nut wheel are revolving at the same speed; but directly the main engines begin to go faster or slower the nut wheel begins to travel on the screw and opens the valve of the cylinder at one end or the other as the case may be, when the piston-rod of the throttle valve gear travels backwards or forwards and so shuts or opens the throttle valve of the main engines.

If the main engine is working at 75 revolutions per minute, the nut-wheel is revolving eight times as fast. When the main engine gains $\frac{1}{64}$th of a revolution, the nut-wheel gains $\frac{1}{8}$th of a revolution; when it gains $\frac{1}{32}$nd of a revolution, the nut-wheel gains $\frac{1}{4}$th of a revolution, and works the throttle valve accordingly. When the main engines gain $\frac{1}{16}$th of a revolution, the nut-wheel gains $\frac{1}{2}$ of a revolution, which then shuts off all steam from the main engines. When the nut-wheel has gained or lost $\frac{1}{2}$ of a revolution, it becomes disconnected from the screw, so that the speed of the small engine is not interfered with. It will thus be seen that this governor is very quick in its action, and thoroughly adapted to the requirements of a marine engine.

Now, although this governor does not anticipate the change of motion, it does the next best thing, it, like the Siemen's differential governor, makes the change of motion directly it takes place, operate the throttle valve, and control the motion of the engine from further acceleration or retardation.

This governor has been fitted to a number of steamers, some of which have boilers carrying steam at 200 lbs. per square inch, and judging from the testimonials which we have seen, the governor appears to be giving the greatest possible amount of satisfaction.

It is interesting to note that the whole device is only 3 ft. long and 3 ft. high. The cylinder for operating the throttle valve is 5 in. diameter and 6 in. stroke, and the cylinder of the engine, which is single acting, is $2\frac{3}{4}$ in. diameter and 2 in. stroke. The fly wheel is 24 in. diameter with a 2 in. square rim and a solid centre. The crank shaft is machined solid out of mild steel, the eccentric, which is 2 in. diameter and 2 in. long, being made solid therewith. The main bearings are three in number, and are $5\frac{1}{2}$ in., 4 in. and $3\frac{1}{2}$ in. in length respectively. The connecting rod is four times the length of the stroke in length, the length of the top and bottom bearings being $2\frac{1}{2}$ in. and $3\frac{1}{4}$ in. respectively. The screw on the shaft is 3 in. pitch with 6 threads, the brass nut fitting thereon being $8\frac{1}{2}$ in. long. It will thus be seen that very ample bearing surface has been allowed in all the wearing parts, and therefore the engine should run for long periods with little attention, and have a very long life.

The lubrication is automatic as far as the guide and the top end of the connecting rod are concerned.

We think that Mr. Keats is to be congratulated on the device as a whole, which appears to have great promise of being a simple solution of a difficult problem.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(*From our own Correspondent.*)

IT is extremely likely that the Particular Service Squadron, which was commissioned on January 14th, will shortly be broken up, two of the cruisers composing it having already been ordered to join the Channel Squadron, while all the torpedo-boat destroyers have been paid off. This squadron, it will be remembered, was composed of two battleships, the *Revenge* and the *Royal Oak*, two first class cruisers, the *Gibraltar* and the *Theseus*, two second-class cruisers, the *Hermione* and *Charybdis*, and six torpedo-boat destroyers. The announcement that these vessels would be mobilised was made on January 8th, and on January 20th the squadron was ready for sea, in fact did put to sea for a short cruise. The time occupied therefore, from the announcement till the squadron was in readiness to act was twelve days, and there was no difficulty at all in providing the 4,000 officers and men required for the purpose. Such a force is somewhat incorrectly termed a "Flying" Squadron, for although composed of vessels of high speed, the two battleships would scarcely be assigned a part in any force designed to act at a distance from home waters as a flying squadron might be supposed to do. The duty of the Particular Service Squadron would in an emergency have been without any question to act as a reinforcement to either the Channel or Mediterranean squadrons, and most probably the latter. It is highly probable that the two battleships and the two first-class cruisers may, after the manœuvres, which will begin about the first week in July, be sent, as was originally contemplated, to the Mediterranean.

Torpedo-boat Destroyers.

Now that the destroyer flotilla which was attached to the particular Service Squadron has been put out of commission, the desirability of despatching more of these vessels to the Mediterranean is again being discussed. At the present time there is only one destroyer, the *Ardent*, attached to the squadron commanded by Sir Michael Culmesigmond, while until recently there were no less than twenty in commission in the Channel and home ports. It is reported that three torpedo-boat destroyers will now be despatched to Gibraltar, and three more to Malta, to perform at these stations similar instructional work to that which is being executed by the flotillas attached to the three naval ports. With the addition of the boats now released from service with the squadron under Admiral Dale's command there are a sufficient number in the reserve to supply from six to ten destroyers for duty in the Mediterranean, and it is at least as necessary for young officers to gain an insight into the navigation of the territorial waters in that sea as in those nearer home. Opportunity would also be afforded for additional engine-room ratings to become acquainted with the use of water-tube boilers. Of the destroyers recently ordered, two are to have a speed of 32 knots, but the others will only be required to attain the 30 knots, which has been the speed stipulated for in previous boats of late date. The two exceptionally fast boats will be built by Messrs. Thornycroft, of Chiswick, and Messrs. J. & G. Thomson, of Clydebank, these two firms, with that of Messrs. Laird's, of Birkenhead, being now the leading constructors of small craft of this description.

Bluejackets at a Tournament.

This year the management of the Royal Military Tournament at Islington having been assumed by the War Office, permission has been given for a small detachment of seamen to give an exhibition of field gun exercise in aid of the charities of their soldier brethren. Some irritation has, however, been created by the treatment of the bluejackets by the authorities of the show, and also by the slight which was shown to the marines, who were not asked to take part in a pageant entitled "The Sons of the Empire." It has always been the acknowledged right of any detachment of seamen present with land troops to take the post of honour to which their position as the most essential factor in the defence of the Empire and their priority of establishment as a standing force entitles them. The Navy also considers the White Ensign as its distinctive colour, the Union Jack being a national emblem common not only to land and sea services, but properly used by civilians as well. As regards both these points difficulties have arisen which if not amicably settled would tend to engender a feeling between sailors and soldiers which is not calculated to have the best results. The omission of the marines from a parade of all arms, entitled the "Sons of the Empire," in which detachments of troops from all the colonies and dependencies as well as from England, Scotland, Ireland and the Empire are to take part, is an inexplicable mistake, for as everyone knows, it is this gallant corps which is always the first to be called upon in any real emergency to provide a force for expeditions abroad. If the tournament is to be a success in every way the War Office officials will do well to remove all cause for heart-burning and jealousy.

Portsmouth Dockyard.

Rumour has been rife recently as to many movements in connection with vessels now in the Reserve at this yard, but so far there is little sign that they have much foundation. It was said that the *Iphigenia* would relieve the *Arethusa* in the Mediterranean, but the *Scylla* has now been commissioned for this purpose. The *Indefatigable* has been named for the Australian station, and the *Melpomene* to relieve the *Dædalus* at Bristol. The *Malabar* is to pay off here and be prepared as a harbour vessel at Bermuda, which seems to be a poor use to make of such a fine vessel. It would be a relief to commission some of the vessels here, for basins and jetties are all crowded up. Perhaps the manœuvres, for which it is said mobilisation will take place on July 7th, will clear some of them away, at least for a time. The departure of the two vessels of the Training Squadron and the portguard ship to her moorings will also create vacancies. Work is proceeding merrily on the *Prince George*, and although this ship will not make a record it is quite certain that she will be ready for her trials in the autumn, the propelling machinery supplied by Messrs. Humphreys & Tennant is in a very forward condition. The *Cæsar* is also growing apace, but this ship and the *Gladiator* cruiser are not intended either to break the record. We have had a great deal of work in connection with the instructional flotilla of torpedo-boat destroyers, illustrating the kind of trouble these vessels will give in war time.

The repairs of the *Edinburgh*, guardship at Queensferry, have been completed. The *Intrepid* after a satisfacfory commissioning trial left for the West Indies to take the place of the *Tourmaline*. The *Salamander* will pay off on June 3, and her crew will then commission the *Spanker* at Devonport. The *Bramble* which has been selected tc commission here as a relief to the *Cockatrice* as special service vessel in the Danube is to be transferred to Chatham for purposes of manning. The *Hunter*, torpedo-boat destroyer, has completed her trials with satisfaction. The *Alexandra* having had her defects made good has returned to Portland, and the *Achilles* has taken her place in dock for overhaul.

Electricity in the Navy.

The propulsion of men-of-war by electricity is virtually unknown in the British Navy, and, indeed, as a motive power it has been used in only a few cases for small boats, and in connection with experiments in submarine navigation. There is, however, in other directions a wide field for the application of the electro-motor, and especially in connection with instruments used in the transmission of signals and orders, and in the distribution of power for actuating several of the numerous small engines fitted for auxiliary purposes on board a man-of-war. It is quite likely that before long we shall see the voice-pipe and the electric call-bell superseded by some form of telephone. The urgent need also for a really trustworthy electro-mechanical telegraph for the transmission of orders from one part of a ship to another is so obvious that it cannot be very long before this want is supplied. Electricity is also likely to come into use for training, elevating, and loading the guns, and for facilitating the supply of ammunition to the heavier kinds of ordnance. For these and similar purposes it has been tried, both in our own and in some foreign navies, and has given every satisfaction; it will be surprising, therefore, if it should not become a rival to the older systems connected with hydraulic and steam gear. The rapid development of this force in connection with bells, firing circuits for guns and torpedoes, for incandescent illumination, search lights, and telegraphy, makes it a certainty that before long electro-mechanical engineering will have been successfully established as an important department in the British Navy.

Brassey's Naval Annual.

This important publication, which was issued last month, is every bit up to the standard of the excellent volumes which have preceded it since the initial copy issued in 1886. Lord Brassey having accepted the responsible and distinguished office of a Colonial Governor, his son, who has edited most of the volumes, states in the preface to the tenth "Annual" that he intends to carry on the work on his own responsibility. Mr. Brassey provides chapters on the progress of the Navy, the relative strength of our own and foreign fleets, the great assembly of war vessels at trial, the manning of our Fleet, and with Captain C. Orde-Browne, on British and foreign naval construction. Two particularly interesting chapters are supplied by foreign naval officers, M. E. Weyl giving a detailed description of the administration and the resources in *personnel* and material of the French navy; while Signor Vecchi (Jack la Bolina) deals in a similar manner with that of Italy. There are three new contributors. Mr. Charles Gleig, late R.N., undertakes a description of the British and foreign manœuvres, the serious illness of Mr. J. R. Thursfield, who has hitherto supplied these chapters, preventing him from doing so this year. Commander Bacon, a well-known expert, writes on "The Value of Torpedo Boats in Wartime," and appraises this description of craft at a high standard. Mr. G. R. Dunell provides an interesting and instructive chapter upon "Marine Engineering and Water-tube Boilers." In another division of the work Mr. Barnes and Mr. Laird Clowes relinquish the compilation of the tables of warships of our own and foreign navies to Commander Robinson and Mr. John Leyland, and these gentlemen have somewhat altered the form of the tables, supplying fresh statistical matter. Captain Orde-Browne writes, as usual, the chapters on armour and ordnance. The illustrations are increased in number, and quite up to the highest standard of this class of art.

Launch of the "Hannibal."

The putting into the water of this battleship at Pembroke was an unqualified success, and the vessel was on April 29th towed to Hobbs Point and placed under the sheer legs to receive her machinery and boilers. It is unnecessary to describe this vessel, as she is in all material respects like her sisters, of which particulars have already been given in detail. The ceremony of naming the vessel was performed by Mrs. Lawrie, the wife of General Lawrie, M.P., who represents the Pembroke Burghs. The assemblage of persons to witness the launch was perhaps not so great as when the Duchess of Saxe-Coburg christened the *Edinburgh*, or when the Duchess of Connaught named the *Empress of India*, but there was a large and representative gathering of visitors, who were completely satisfied with the arrangements made by the superintendent of the yard and his assistants for their benefit. It is feared that the intentions of the authorities to make Pembroke a fitting as well as building yard cannot be carried into execution in connection with the *Hannibal*, and that she will have to go to Devonport to be completed; the *Andromeda* will, however, be fitted out at the port. That this yard and that at Haulbowline are to receive the consideration of the Admiralty, and that in both cases an extension will take place, is now quite certain.

The Needs of Naval Engineering

In the discussion on the naval essays which took place at the Royal United Service Institution, several representatives of naval engineering took part, and their remarks were received with the greatest possible attention by the representative gathering of officers of all branches of the naval service present. Chief Inspector of Machinery, C. Johnson, who has recently retired, had prepared a very interesting paper, which he read, and which will be printed *in extenso* in a future number of the journal of the Institution. He does not believe in the mercantile marine as a source of supply, either for officers or men, to this branch, because, in the first place, at least six years' training are absolutely necessary to make a naval engineer, of which time he considers nearly five years essential to the proper handling of tools. The stokers and firemen of the merchant marine would also require training before they would be available as an effective and efficient reserve. With regard to the position of naval engineers he classified his remarks under three heads. First, training, which must be adequate; secondly, numbers, which must be increased; and thirdly, authority, as to which he considers larger powers should be given over their own men. Chief engineer Edwards, of the *Powerful*, also spoke in support of what had been said by Mr. Johnson, and his remarks evidently met with considerable approval from many of his hearers. It cannot fail to be of interest to the engineering corps that two officers so highly respected as these gentlemen should have had an opportunity of placing on record the opinions of their brothers in the naval service.

Devonport and Keyham.

The launch of the *Arrogant* and the completion of the *Renown* and *Talbot* has been followed, if one may say so, by a period of comparative stagnation. This is not to say that work has ceased, far from it, but the progress now being made is of a steadier and less dramatic nature. In addition to the continued construction of the *Furious*, a sister to the *Arrogant*, there is a large amount of repairing work under way, but it appears not to be contemplated to proceed with the new battleship for some little time. Perhaps the visit of the Lords Commissioners of the Admiralty and the advent of a new Commander-in-Chief, may make a difference in these matters. The *Renard*, which has been undergoing repairs here, is now completed. The refit of the *Benbow* is complete, but that of the *Melampus*, owing to the state of her boilers, will occupy some time yet, it has indeed been suggested that she will be relieved by another vessel before the manœuvres take place. The *Warspite* will, after certain repairs are effected at Haulbowline, come here in order to receive her quick-firing 6-in. guns in place of those she now carries.

The Engineer-in-Chief and Naval Engineers.

Mr. Durston, C.B., is an authority to whom all must listen when he gives his opinions on naval engineering and allied topics. He has been writing recently to the honorary secretary of the Institute of Marine Engineers *apropos* of a paper read by Mr. T. Cooper on "Engineers and the Royal Naval Reserve," and as what he says may be taken as the official view it deserves every consideration He contends that no account has been taken of the staff of chief engine-room artificers and of engine-room artificers, who, he claims, correspond with the junior engineers of the old Navy or the Mercantile Marine. When these are taken into consideration, says Mr. Durston, our engine-room staffs compare favourably in every way with those of the Mercantile Marine. With regard to the assistant engineers for temporary service as recently advertised for, Mr. Durston urges that the regulations show that the authorities wish to get the pick of the young mechanics whose parents have made some sacrifice for them. It is not, however, intended to tap this source of supply to any great extent at present. Engine-room artificers perform junior engineers' duties, and therefore the head of the Naval Engineering Department thinks that their case should receive consideration as to whether some of them might not receive warrant officers' rank. Only in an emergency such as we cannot at present contemplate, would engineers from the merchant service be drafted into the Royal Navy. Finally, Mr. Durston records his opinions that engineer officers in the Navy should be put on the same footing as regards training, &c., as the executive or deck officers.

Torpedoes and Torpedo Warfare.

The public of this country are, on the whole, very ignorant of the science of torpedoes and the theory of torpedo warfare, and perhaps pardonably so, because until recently the only comprehensive text-book on these subjects was of a nature too technical to be read by the ordinary civilian. The popularly written work of Lieutenant George Armstrong, now issued as one of the series of Navy Hand-books published by Messrs. Bell, removes this stigma from our literature, and places it within the reach of an intelligent Englishman to make himself thoroughly cognisant not only of the appearance of these weapons of war, but of their proper use. Lieutenant Armstrong deals with his subject in a singularly interesting manner, and the history and present condition of the weapon and all its accessories, as well as mines, nets, and torpedo craft generally, are so lucidly explained, that quite a thrilling interest is imparted to the subject. The concluding chapters of the book are supplied by an officer who, during the late Chino-Japanese war, actually saw and participated in torpedo warfare, have a special importance. All who are interested in the efficiency of the Navy should study this work, which is, moreover, beautifully and profusely illustrated with photographs, diagrams, and a very graphic, original drawing by M. Martino, the Queen's naval painter.

Sheerness Dockyard.

There is no very marked change in the condition of affairs at this yard since I wrote last. The *Pelorus* continues to furnish employment to the largest number of men. In addition to small craft, the *Cleopatra* and *Champion* have had a fair share of labour, but it is scarcely expected that the *Tourmaline* will take the place of the former vessel on the weekly pay-book. Probably she will, after paying off, join the Dockyard Reserve like the *Garnet*, her sister ship. The *Swallow* is another visitor that may give employment, but this is uncertain. What is to be the future career of the *Cleopatra* is still a matter of doubt, but one story is to the effect that she will be commissioned to perform similar work to that on which the *Northampton* is engaged, viz., as an auxiliary training ship for boys' newly entered. The arrival of the machinery of the *Pelorus* from Clydebank makes it pretty certain that this vessel will be passed into the A division of the Medway Reserve within fourteen months of the laying of her keel plate. The repair of the *Onyx* has been completed, and she has left for Harwich to resume her duties. The *Niger*, her sister ship, has also left after a similar overhaul. The *Tourmaline* arrived here from the West Indies on May 21st, and will dismantle and go out of commission at this yard.

Cruises and Trial Trips

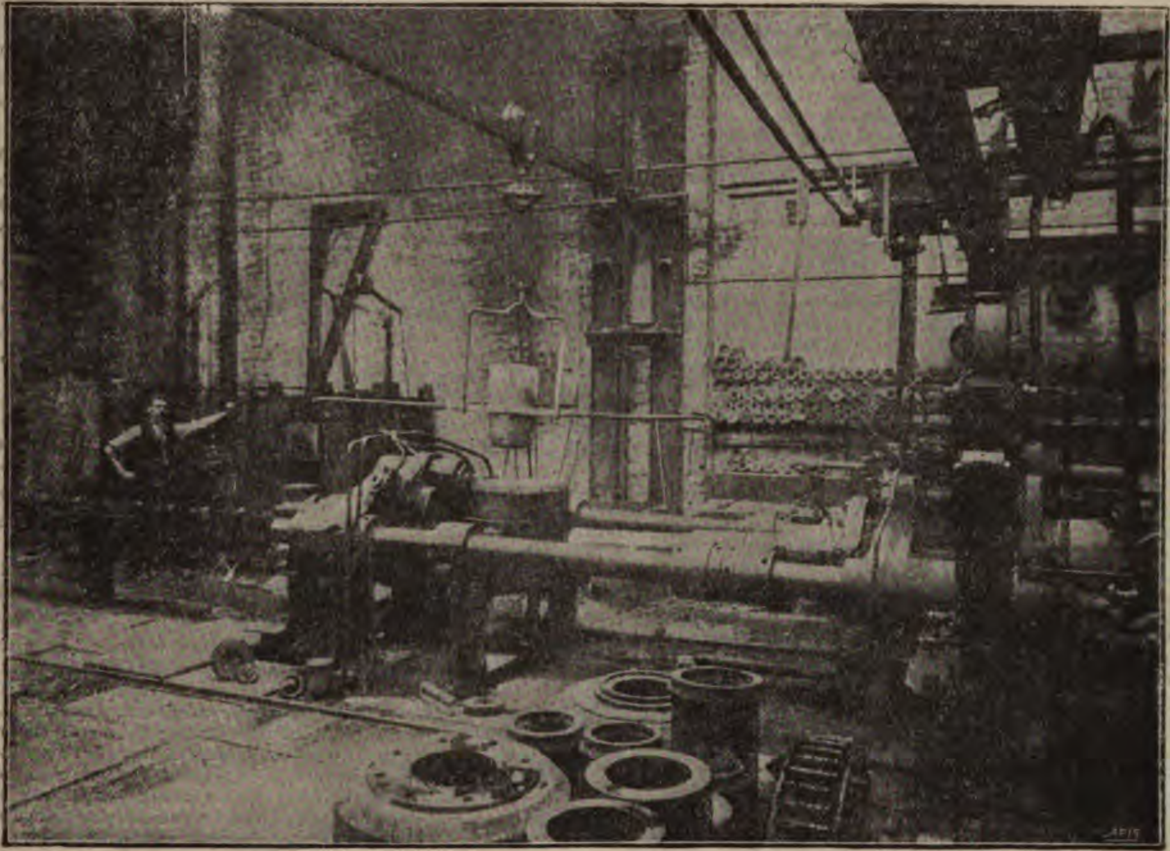
Special interest attaches to the trial of the *Talbot*, the first of her class of cruisers to have her machinery tested on the mile. This vessel, which has been built and engined at Devonport, has just completed most satisfactorily all her trials in the Channel. On the forced draught trial the mean results were: Steam, 144 lbs.; vacuum, starboard, 25 in.: port, 25 in.; revolutions, starboard, 144·2: port, 138·9; I.H.P., starboard, 4·957; port, 4,819; total, 9,776; air pressure 1·06 of an inch; speed, 20 knots. The machinery worked very smoothly, and there would have been no difficulty in increasing the H.P., but with that which was guaranteed only slightly exceeded half an knot in excess of the estimated speed was easily obtained. The thirty hours' coal consumption trial which followed was made with the engines working at ⅝ of the natural draught power. This, it is calculated, is the most economical rate at which this design of cruiser can steam for long periods at a time. The mean results for the thirty hours' were: Vacuum, starboard, 26 in.; port, 26·1 in.; revolutions, starboard, 114·9; port, 113·5; I.H.P., starboard, 2,451; port, 2,462; total I.H.P., 4,913; speed, 16·68 knots. The coal capacity (normal) of this class of cruiser is 550 tons, and with this amount in the bunkers, the vessel steering at the above rate of speed could, as the coal consumption recorded was 1·84 lbs. of coal per each I.H.P. per hour, cover a fairly long distance. The opening up of the machinery examination was very satisfactory.

Explosion on Board the "Terrible."

The accident which occurred on board the first-class cruiser building at Messrs. Thomson's, at Clydebank, reveals the fact that we are as yet unacquainted with some of the dangers to which modern ships of war, and possibly merchant vessels, are exposed now that it is necessary to paint their inner skins. It appears that a gas was evolved from the paint with which the bilges of the huge cruiser was coated, and that this found its way into the circulating pump chamber, when it caused an explosion as soon as a naked light was brought into contact with it. The result was considerable damage to this part of the vessel, which, fortunately, was unattended with loss of life. The accident recalls the loss of the *Dotterel*, which was attributed to a similar combustion of volatile gas. The report of the Admiralty chemist has not been made public, but in the general interest it is to be hoped that it will be, and that all the light that can be thrown on the causes of the accident will be made public. Fortunately, the damage to the vessel is not great, and will probably be covered by the provision of a new circulating pump chamber, but it is only right that all should learn by this experience, especially as several explosions which have occurred recently in the holds or other parts of vessels below water are still unexplained.

Pembroke Yard.

With regard to the proposed alterations and extensions at this yard, the Secretary of the Admiralty has written to the local member stating that he does not understand how any misapprehension can have arisen in regard to the Admiralty proposals in this connection. The construction of the jetty will be proceeded with as soon as the proposal has received Parliamentary sanction, but the work will not be completed this year and provision will be made for its completion in 1897. General Laurie holds out some hopes of the *Hannibal* being completed at the yard, but he is not very sanguine, because it will be necessary to get her away by January in order that the *Andromeda* may take her place alongside the wharf at Hobbs Point. He does not despair of seeing 3,000 men at work in the yard with two ships in the water and two on the slips. The tube which has been manufactured by Messrs. Whitworth & Co. to give armoured protection to the telegraphic communication between the bridge and the conning tower of the *Andromeda* has been delivered and placed on board the ship. The masts of the *Hannibal* are to be delivered here, and Sir William White, who has visited the yard, has expressed himself as satisfied with the progress made on that vessel and the *Andromeda*.



THE PRODUCTION OF METALLIC BARS OF ANY SECTION BY EXTRUSION AT HIGH TEMPERATURES.

Chatham Dockyard.

The building programme at this yard is being carried out with rapidity and it is certain that the *Victorious* and *Minerva* will be completed before the autumn. The trials of the cruiser will probably take place almost immediately. The *Illustrious* will soon be ready for launching. Nearly the whole of the propelling machinery for this ship has been received in the yard from the contractors, Messrs. Penn & Sons, of Greenwich, and everything looks most flourishing for her progress. Repairing work and the preparation of ships for commission has prevented the *Vindictive* being pushed on, but she is not what can be called behind her time. The *Grafton*, which has hoisted the flag of Admiral Oxley, who is to be second in command on the China station, will leave here as soon as possible after June 4th to relieve the *Edgar*. Her repair and refit is of the thorough nature and this will possibly delay her a little. The *Ranger*, having completed her trials, is now ready for sea, and it is still thought likely that with the *Haughty* she may be sent to Malta. The *Scylla* hoisted the pennant on May 28th, and will leave for the Mediterranean to take the place of the *Arethusa*. The *Jupiter* is to come here from Clydebank for completion. The *Mersey's* refit was completed on the date already mentioned, and she left for her port. The *Agincourt*, having had a few external defects made good, has had her hull recoated with an anti-fouling composition. The *Gossamer* is being prepared at this yard for a commission in the Mediterranean, but no date has yet been fixed for her to hoist the pennant. Of vessels being re-armed at this yard, the *Galatea's* ports are nearly finished, the *Severn* is ready for her trials of the new armament, and the *Leander* is also in hand being prepared for her new guns.

North-East Coast Institution of Engineers and Shipbuilders.—The summer excursion of this Institution will be to Cardiff, *via* Leeds, Crewe, and Pontypool-road, on the 22nd of June, calling at Sunderland and Stockton-on-Tees, and will return from Cardiff at about 9.30 a.m. on Saturday, June 27th.

THE PRODUCTION OF METALLIC BARS OF ANY SECTION BY EXTRUSION AT HIGH TEMPERATURES.*

THE author stated that the system of manufacture he now had the privilege of bringing before the Institute was the invention of Mr. Alexander Dick, the inventor of Delta Metal. It related to the production of all kinds of metallic sections, from thin wire or plain bars to complex designs, by simply forcing metal, heated to plasticity, through a die by hydraulic pressure. He referred to the fact that although the principle of extrusion was employed in the manufacture of lead pipe and lead wire, yet the temperature was very much lower than in Mr. Dick's system, which required the metal to be red hot (about 1,000° Fahr.).

Mr. Dick's process consists in placing the red hot metal in a cylindrical pressure chamber or container, at one end of which is a die. Upon pressure being applied at the opposite end the plastic metal is forced through the die, issuing therefrom as bars or rods of the required section and length. The container of the first apparatus was a solid steel cylinder, bored out to the required diameter to form the chamber for the hot metal, and heated in a coke fire. In practice, however, it was found that the strain set up by the internal pressure applied to force the metal through the die, developed cracks in the cylinder, which rendered it useless. After a long series of experiments with various kinds of steel cylinders, Mr. Dick abandoned the solid wall principle and devised a built-up container. It is composed of a series of steel tubes of different diameters, placed one outside the other, with annular spaces between them, the spaces being filled in with a dense non-conducting packing. This proved perfectly successful, and machines on this principle are now in operation on a commercial scale not only at the works of the Delta Metal Co., Pomeroy Street, New Cross, London, of which Mr. Dick is managing director, but also in Germany, and at one of the large Midland metal rolling mills, on licence.

These machines are served by two men and one boy, so that the cost of labour per ton is very small.

The author described the working of the system and referred to the great variety of sections (some of a very complex nature) produced in Delta metal, brass, aluminium, aluminium bronze, and other alloys and metals, samples of which were exhibited. These ranged from wire weighing about 1-100th of a pound per foot run, to heavy rounds, squares, and hexagons weighing 40 lbs. and over per foot run. He pointed out that the pressure put upon the metal greatly increased its strength, and at the same time rendered it still more homogeneous. Some tests made at Woolwich Arsenal with Delta metal bars produced by extrusion showed a tensile strength of 48 tons per square inch, with 32·5 per cent. elongation on two inches, as against 38 tons per square inch tensile strength and 20 per cent. elongation of rolled bars of the same metal.

PEEL'S ANTI-FOULING BOILER FLUID.

IT is a matter of common knowledge among steam users that great difficulty is experienced in preventing the formation of scale or incrustation in boilers, more especially in those in which circumstances necessitate the use of water containing large quantities of impurities, such as sulphate and carbonate of lime, chloride of sodium, silica, &c., left by the water when evaporated. Some of these materials form salts insoluble in water, and therefore require removal by mechanical means, known as "scurfing."

The liability of injury from overheating, due to a heavy deposit of incrustation on the plates forming a non-conducting covering, is very great, and steam users are always on the look-out for some means by which the removal of deposits becomes an easy matter.

This problem has been attacked by Mr. William Peel, of Calabar Buildings, Tithebarn Street, Liverpool, and as a result of numerous and exhaustive experiments, he has arrived at the result of the production of an effective anti-fouling boiler fluid, which prevents the formation of scale by separating the noxious particles from the water, and precipitating them, so that they may be easily blown or brushed out, while at the same time it is non-injurious in itself to the boiler.

The composition is a fluid which is free from acid, and is guaranteed as being made from purely vegetable matter which can in no way produce any harmful result upon the boiler-plates, mountings, packings, and other vital parts.

Another point in its favour is its low specific gravity, viz., 1·028, for the reason that it very readily mixes with water in the boiler, and thus does not produce local action on the plates.

Scale on the boiler-plates not only shortens the life of a boiler by the overheating of the parts and the subjecting of the various parts of the boiler to heavy strains brought about by the unequal expansion and contraction set up in the parts from the different amount of heating of those parts, but is also responsible for great waste of fuel, as will be readily appreciated by a study of the following statistics:—

$\frac{1}{8}$ in. incrustation requires 28 per cent. more fuel to do the work.
$\frac{3}{16}$ " " 35 " " " "
$\frac{1}{4}$ " " 60 " " " "
$\frac{1}{2}$ " " 150 " " " "

It is claimed that the fluid also tends to reduce priming, and a feature in its favour is the small quantity necessary to keep a boiler clean, for example, it is stated that one gallon per week will keep a 40 H.P. boiler clean.

Anti-Attrition Metal.—Some very interesting particulars regarding the most recent results given in the actual working of their metals have recently been forwarded to us by the Anti-Attrition Metal Co., Limited, of Emerson Street, Southwark, S.E. Regarding the durability of this company's metal the results given in a trial made on the London, Chatham & Dover Railway may be regarded as conclusive. In this test a second class carriage was fitted with two Anti-Attrition metal bearings weighing 10 lbs. 10 ozs., and also with two best gun-metal bearings weighing 12 lbs. 12 oz. After two months constant running the four bearings were taken out and carefully weighed when it was found that the gun-metal pair had lost at the rate of 16 ozs. per month compared with $6\frac{1}{4}$ ozs. per month for the two made of the company's metal. The engineer to the railway company further states that the mileage got out of the latter bearings was, up to the time of his report, 138,240 miles. As the results of tests made by another railway company, it was found that four Anti-Attrition metal bearings, weighing, when new, $31\frac{1}{2}$ lbs., had lost, after 85,000 miles running, $14\frac{3}{4}$ ozs., as against 2 lbs. $5\frac{1}{2}$ oz., lost by four phosphor bronze bearings (weighing initially 41 lbs. 13 ozs.), after running the same distance under the same conditions. In a further competitive test between 16 bearings made from the company's metal, and 14 made of the best gun-metal, it was found after 11 months running that the former had lost 1·03 ozs. each as against 1·6 ozs., each lost by the latter. If further proof of this metal's durability is wanted it is furnished in the case of a second class carriage, where, after three months' running, two gun-metal bearings had to be taken out as unfit for further service, whereas the two Anti-Attrition bearings fitted to the same carriage were found, after seven months' running, to be in good serviceable condition.

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*Abstract of paper read before the Iron and Steel Institute at the Spring Meeting, May, 1896. By Perry F. Nursey.

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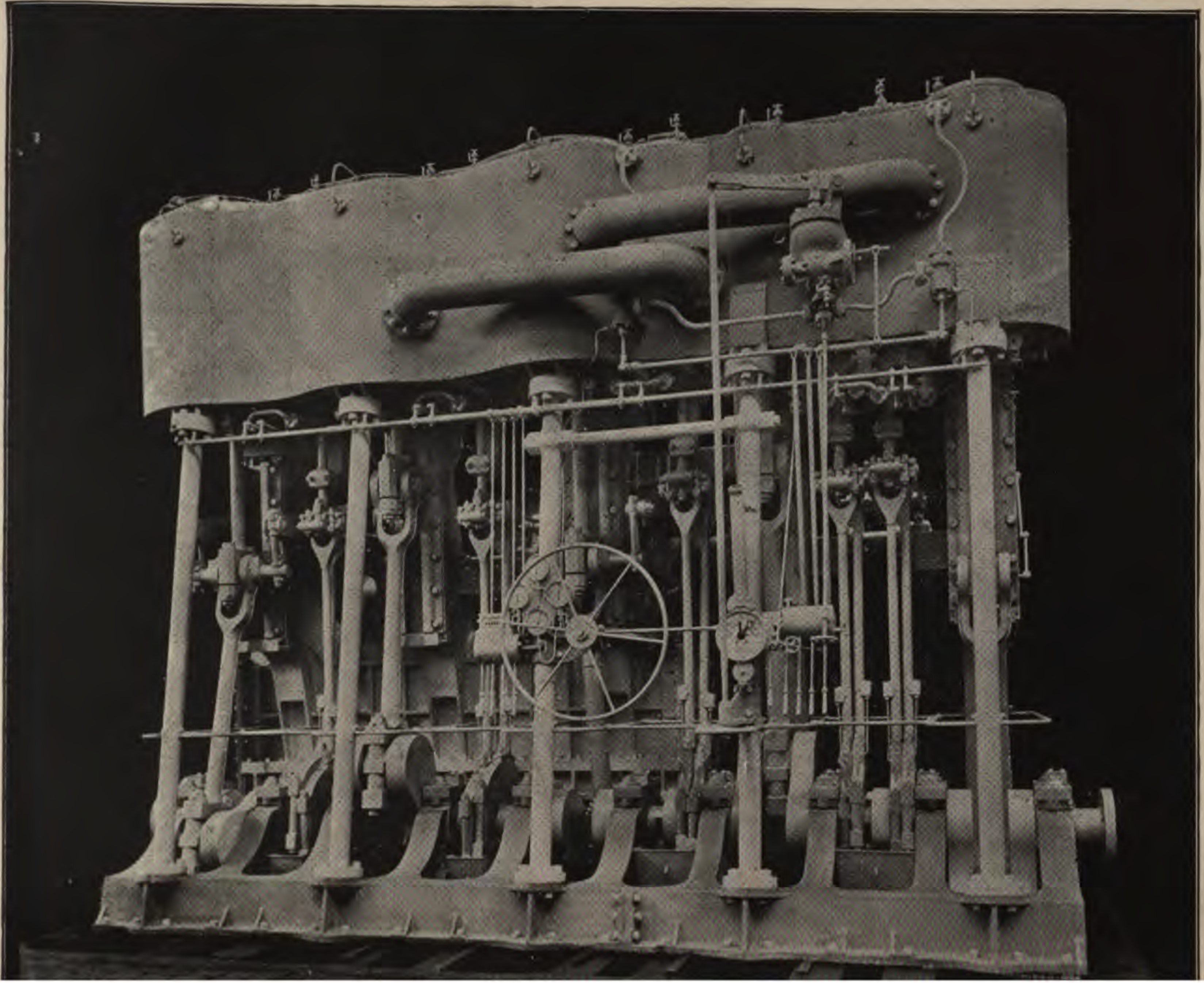

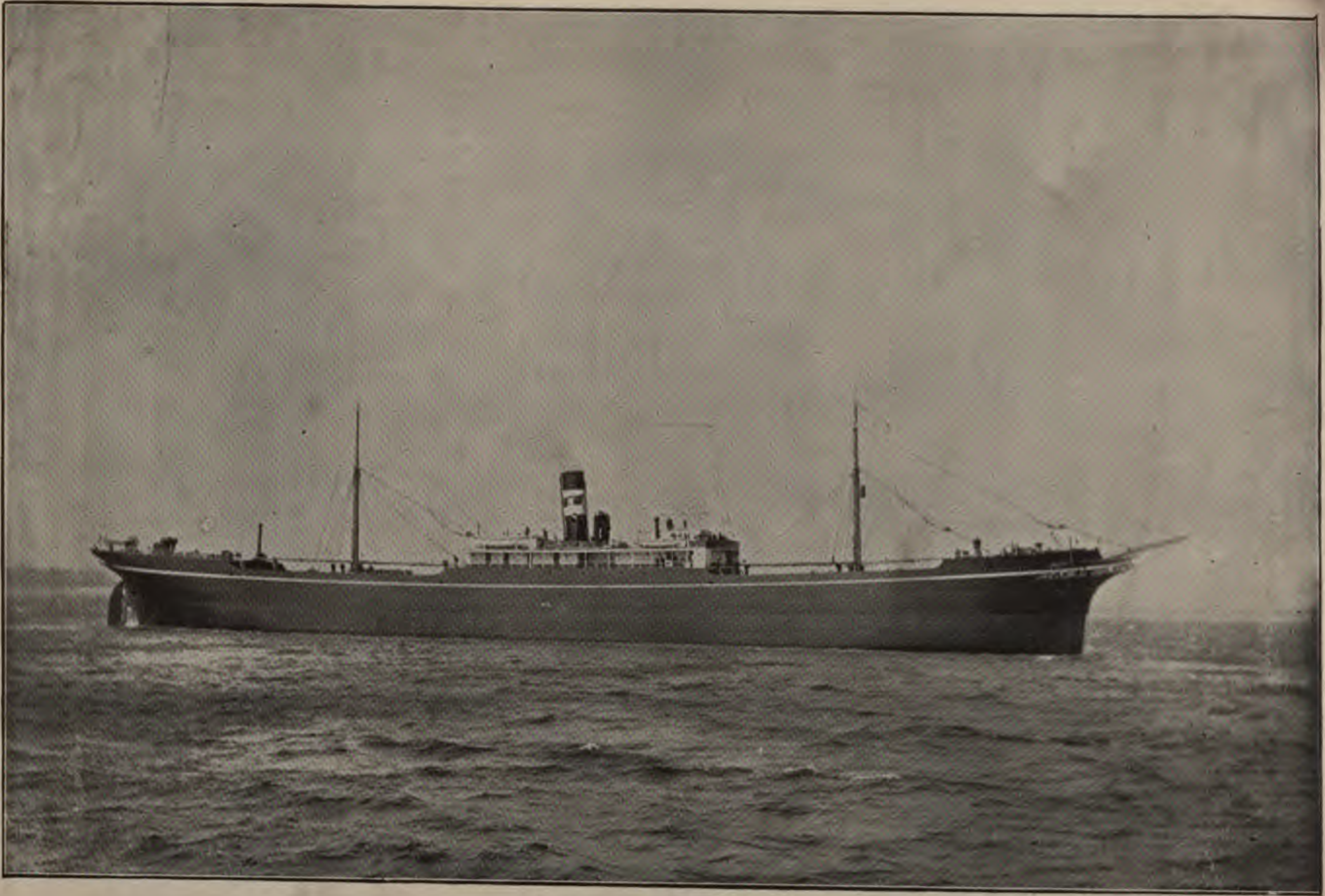

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NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from April 24th to May 26th, 1896:—

Alexander, I. J., retired staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet on the Retired List.

Aston, Samuel, chief engineer to the *Scylla*, to date May 28th.

Austen, Edwin J., chief engineer to the *Intrepid*, to date April 28th.

Baldwin, Henry S. C., engineer to the *Active*, to date April 28th.

Barber, J. H., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Campbell, Edward J., engineer to the *Colossus*, additional for the tender *Renard*, to date May 1st.

Cooke, G. H., retired staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet on the Retired List.

Crowle, Joseph N., engineer to the *Vivid*, for the *Shark*, to date May 7th.

Dawson, Thomas J., assistant engineer to the *Alecto*, to date May 2nd.

Faulds, Arthur G. F., engineer to the *Colossus*, additional for the tender *Renard*, to date May 1st.

Fletcher, George Herbert, assistant engineer (temporary), to the *Pembroke*, to date May 1st.

Fletcher, George H., assistant engineer (temporary), to the *Scylla*, to date May 28th.

Green, Donald P., engineer to the *Britannia*, additional for the *Racer*, when commissioned, to date May 28th.

Griffiths, Percy F., assistant engineer (temporary), to the *Victory*, to date May 1st.

Griffiths, Percy F., assistant engineer (temporary), to the *Magnificent*, to date May 22nd.

Guyer, T. S., engineer to the *Victory*, for the *Starfish*, to date May 7th.

Hall, Charles R., engineer to the *Vernon*, additional, to date April 28th.

Hicks, John A. H., chief engineer to the *Vivid*, additional for the *Doris*, to date May 6th.

Howell, Llewellyn, assistant engineer to the *Victory*, additional for the *Powerful*, to date May 22nd.

Hyde, T. H., staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet.

Jameson, Thomas O., assistant engineer to the *Victory*, additional for the *Terrible*, to date May 22nd.

Jose, Francis W. R., engineer to the *Vivid*, additional for the *Renown*, to date May 6th.

Legate, William P., acting engineer to the *Colossus*, additional for the *Renard*, to date May 1st.

Leighton, Walter J., assistant engineer to the *Victory*, additional to the *Bramble*, when commissioned, undated.

Liversidge, J. G., engineer to the *Wildfire*, for the *Snapper*, to date May 7th.

Martell, Richard W., engineer to the *Intrepid*, to date April 28th.

Monkhouse, W., engineer, has been placed on the Retired List of his rank.

Morris, T. A., retired staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet on the Retired List.

Murray, Alfred E. J., assistant engineer to the *Victory*, additional for the *Terrible*, to date May 22nd.

Newton, Walter W., assistant engineer (temporary), to the *Victory*, to date May 1st.

Pendleton, Frank R. (probationary), assistant engineer to the *Hawke*.

Pettit, W. J., fleet-engineer, has been placed on the Retired List, with permission to assume the rank of Inspector of Machinery.

Phillips, Richard, chief engineer to the *Vivid*, additional, to date May 6th.

Radford, Henry George, assistant engineer (temporary) to the *Vivid*, to date May 1st.

Rattenbury, E. J., staff engineer, has been placed on the Retired List of his rank.

Rodet, E. W., engineer to the *Victory*, for the *Hart*, to date May 7th.

Rosevere, Edward J., assistant engineer to the *Bellona*, to date May 28th.

Scullard, George H. (probationary), assistant engineer to the *Intrepid*, to date April 28th.

Serle, R. T., retired staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet on the Retired List.

Shirvell, James J., assistant engineer to the *Victory*, additional for the *Powerful*, to date May 22nd.

Smith, Frederick T., assistant engineer to the *Magnificent*, to date May 2nd.

Stewart, W. H. W., engineer to the *Vivid*, for the *Opossum*, to date May 7th.

Swift, Lionel W., assistant engineer to the *Defiance*, to date May 6th.

Tregenna, Henry E., engineer to the *Scylla*, to date May 28th.

Venning, Albert John, assistant engineer (temporary), to the *Vivid*, to date May 1st.

Vinning, Cecil Edward, assistant engineer (temporary), to the *Pembroke*, to date May 1st.

Vinning, Cecil E., assistant engineer (temporary), to the *Grafton*, to date May 14th.

Watkins, B. J., engineer to the *Vivid*, for the *Rocket*, to date May 7th.

Webb, Arthur T., engineer to the *Pembroke*, additional, for the *Gossamer*, undated.

Whebby, Thomas, staff engineer, to the *Vivid*, additional, for the *Belleisle*, to date May 19th.

Wingfield, H. E., fleet engineer to the *Magdala*, additional, for the *Abyssinia*, to date May 19th.

HOAR & BROWN'S HARDWOOD MARKET REPORT, MAY 21st, 1896.

Teak.—	Timber. Loads.	Planks. Loads.	Blocks. Loads.	Total. Loads.
Stock, 1st May	7,628	2,602	81	10,311
Landings	236	99	—	335
	7,864	2,701	81	10,646
Deliveries	978	206	7	1,191
Stock, 15th May	6,886	2,495	74	9,455

The deliveries of timber have been exceedingly good, and landings are light. Prices still keep up, with every prospect of a further advance. The plank trade remains good and shippers are asking enhanced figures for forward deliveries.

Mahogany.—There has been a decided drop in quotations for large sizes, the demand for this class being limited. There is also the fear of reduced value in the near future for mahogany of all descriptions, the yards being fairly well stocked and doing but little business. The call for African, which used to be very lively, has almost fallen away. Panama also is scarcely enquired for, although so much in favour a short time ago. The importations of late have not been up to the usual standard, which may be one of the reasons for dull prices. Trade among the dealers, also, has been exceptionally quiet in Cuba, unless we may exempt the minimum stocks, there being always buyers at outside low prices. Some good stocks of Honduras are still available. The price for this rules higher than any other, and it is mostly of good character. A shipment from Truxillo, lately arrived, has turned out very unsatisfactory.

Cedar.—Interest in this wood has practically ceased, in consequence of prices ruling so high. Arrivals of Panama and other cedars have made no difference to the small quantities landed of the genuine article.

Walnut.—The advanced tone which was observed lately has quite disappeared and a more easy market now prevails. Some considerable business is being done.

Whitewood.—The import of logs has been restricted, prices are weak, and shippers do not care to risk consignments. In lumber, trade is still brisk, and prices keep firm, the consumption showing an important item.

Kawrie Pine.—Logs are changing hands, and a fair business doing. Planks have not gone so briskly as of late, but prices remain fairly steady. A large cargo is shortly expected to arrive here.

Greenheart.—The log trade is still quiet. Stocks have not been increased for some considerable time. The demand for the last few years has varied little, if at all, and a small stock is all that is required for the few enquiries which reach London.

Sequoia.—Stocks are reduced considerably, and prices remain firm.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(From our own Correspondent.)

DURING last month the Clyde and Belfast engineers demanded an advance. In Belfast notices were served on the local engineer employers for a further advance of a shilling a week. The question of a reduction of the working hours per week was not to be pressed in the meantime. Mr. Biggart, secretary of the Clyde Federated Employers' Association, received a notice from the Glasgow district of the Amalgamated Society of Engineers, with a demand for an halfpenny an hour increase and a 53 hours' week, to which Mr. Biggart said he could hardly say what might be done by the employers in the matter, as the communication, far from having been considered by them, had not been submitted to the general body.

In Greenock the question of reducing the working hours from 54 to 53 has not been considered at all by the men, who are said to be rather annoyed, as well as surprised, that the demand should have been made on behalf of the Clyde. In the matter of wages they expected that an increase of ½d. would be made. The engineers in the lower reaches of the Clyde do not approve of the action of the Glasgow District Committee. In Greenock and Port-Glasgow the minimum wage is 7¼d. per hour, while in Glasgow it is not above 6¾d.; so that, while the advance asked is not too great for Glasgow, ¼d. would be considered enough for the lower reach men, as it would bring them up to the rate which held five years ago, but which was reduced by farthings to 7d. The men also state that the reduction of one hour in the working time per week is nonsense. If a ballot is taken in Greenock district, the vote will probably go solid for ¼d. advance.

All the branches of the engineers in Greenock have held a meeting to discuss the action of the Glasgow District Committee. The conclusion come to unanimously was that a reduction of one hour was not wanted, but the men consider that an increase of ¼d. per hour should be asked, as this was the understanding at the end of the strike in January. They have, therefore, given notice to this effect, the increase to take place immediately after the Fair Holidays in July. Several of the employers in the district have, we believe, notified privately their intention to grant the increase. At a mass meeting of Arbroath engineers held on Friday night, March 22nd, replies received from the masters to the request for an increase of wages were read. They were considered very unsatisfactory. It was unanimously resolved to abide by the demand for an increase of 2s. per week, and that notices be tendered by those requiring to give notice by Wednesday, May 27th, unless a favourable reply be received by that time; and, if the advance be not conceded by Tuesday, June 2nd, that the men cease work on that date.

The Channel Squadron, which comprises 11 warships and a number of torpedo boat destroyers, arrived in the Clyde on Tuesday afternoon, May 19th It was witnessed by large crowds of people on Gourock and Greenock piers, although the weather at the time was very boisterous. The Squadron is under the command of Vice-Admiral Lord Walter T. Kerr, with Rear-Admiral Armand T. Powlett second in command, leaving again on Saturday, May 23rd, for Lamlosh Bay and Oban. From there it will next proceed to Stornoway.

Messrs. Chambers Brothers, who are removing their entire plant from Dumbarton to Greenock, have contracted to build for the Hamburg-American Steamship Co. another 60-ft. steam yacht and 30 collapsible boats. They have just completed for the Japanese Government 12 collapsible boats. The erection of a boat-shed is being built by the firm, 80 ft. by 40 ft. and another 80 ft. in length, to run up to the wall in Main Street, Cartsdyke. Messrs. Chambers have also taken over the large Harbour Trust shed on the west side of Cartsdyke Harbour, which will be utilised as a machine shop. Three launching ways are to be laid down in the new yard.

Messrs. Murdoch & Murray, shipbuilders, Port-Glasgow, have contracted to build a steel twin-screw steamer for passenger and cargo service on the River Amazon, similar to several previously built by them for the same owners. Messrs. David Rowan & Son, Glasgow, will supply the steamer with triple-expansion engines.

Messrs. Wm. Simons & Co., Limited, Renfrew, have received an order to construct a large and powerful hopper dredger for Devonport. The vessel is to be employed in removing blasted rock, and is the second vessel ordered for this purpose.

Messrs. the Grangemouth Dockyard Co. have contracted to build a first-class steamer for mail and passenger service for a colonial firm. Messrs. Muir & Houston, Glasgow, will construct the engines. The vessel is to steam at a very high rate.

Messrs. Mackie & Thomson, shipbuilders, Govan, have, we understand, contracted to build six steam trawlers, each about 100 ft. long. The vessels will be duplicates of the trawlers recently built by the same firm.

Messrs. Caird & Co., Greenock, are building, for the P. & O. Co., two passenger steamers of 8,000 tons each and 12,000 effective H.P. each.

Messrs. Alex. Stephen & Sons, Linthouse, are building a steamer of fully 5,000 tons.

Messrs. Charles Connell & Co., Whiteinch, are building a steamer of fully 4,000 tons for the Harrison Line.

Messrs. Denny Brothers, Dumbarton, have on hand a fast paddle steamer, for the Dover and Calais trade, of about 1,000 tons, and another of similar tonnage for the Holyhead mail service.

Messrs. A. & J. Inglis, Pointhouse, are building a paddle steamer of about 12,000 tons for the River Plate trade.

Messrs. Archibald Macmillan & Co., Dumbarton, have two steamers of about 3,000 tons each.

Messrs. M'Lean & Carmichael, shipbuilders, Greenock, have contracted to build a fine steel screw-tug for Sir Donald Currie & Co. She is intended for the Delagoa Bay service of the Castle Line steamers, and will be built up to Lloyd's highest requirements. It is probable that she will also be engined at Greenock.

An engineering firm in Greenock has contracted to supply engines and boilers for a large steamer building in Glasgow.

TRADE NOTES FROM THE TYNE, WEAR, TEES, HARTLEPOOLS, &c.

(From our own Correspondent.)

THE TYNE.

Shipbuilding.—In this district, as at other centres of shipbuilding, the condition of the industry seems to have undergone little alteration since last month. Occasional orders for vessels to meet exceptional or special requirements are still heard of; but there is nothing approaching to a strong demand as yet in evidence, and were it not for the Government work that is now in progress, the state of business would be very little removed from absolute slackness. An order for a large cargo steamer that has just been placed was so keenly competed for, that the successful firm offered to build a steamer to carry over 5,000tons, for the sum quoted by another firm in respect of a 4,500 ton boat, and by these somewhat questionable means, secured the contract. The reason one firm could so far outstrip another, in practically the same district, lay in the fact that the successful firm had some vessels building of the size which they proposed to supply in this particular instance, and would consequently be able to avoid a good deal of designing and other work in the initiatory and subsequent stages. We mention this incident to show how mistaken those persons are who seem to imagine that because a certain number of yards are full of work the shipbuilding industry on the whole is in a high state of prosperity. That it is not so, is perfectly well known to those immediately interested, and it cannot be of any benefit to legitimate interests to have other than the truth disseminated.

A quite unexpected wages dispute, or rather misunderstanding, which cropped up towards the end of April, has proved an obstruction to trade development, and has unfortunately shown a lamentable absence of right feeling on the part of a section of the operatives towards the employers. As announced in the Marine Engineer for May, a settlement of the wages question, was made with all sections of the shipbuilding and engineering operatives including the members of the Amalgamated Engineers' Society. It eventually turned out, however, that the settlement with the latter body was really not a settlement; for the employers understood they were dealing with men having 30s. per week and upwards, whilst they in reality had to do with men rated at below that rate as well as above it. The employers, acting under the former assumption, agreed to give a larger advance than they would have given had they known the truth, thus being in a sense out-manœuvred by the representatives of the engineers, who appear to be gifted with a rare capacity for driving a bargain. As soon as the employers discovered their mistake they very naturally attempted to set matters right from their own point of view, which attempt resulted in a partial strike, and a general, though temporary disturbance of friendly relations. An interchange of communications—conciliatory on the part of the employers, and somewhat dictatorial on the part of the men—took place between the parties, and the subject of difference was finally disposed of on May 19th, when at a meeting in Newcastle, the employers consented to stand by an agreement—entered into under a misapprehension—yet binding because it was made. It may be inferred from the foregoing that—thanks to school board influence in youth, or trade union training in maturity—working men are becoming preternaturally sharp, and it behoves employers to look very warily into the various aspects of a question in future before committing themselves to any specific course of action.

The principal shipyards on the Tyne continue to show a good array of work on the stocks, though few additions have been made since last month. The Palmer's Co. have another of the Hamburg-American boats nearly ready for launching, and the construction of some other large merchant vessels that are on the stocks at the Jarrow Yard is being pushed on with a dispatch only attainable by the aid of first-class appliances. At the company's Howden yard every possible exertion is being made to put the torpedo destroyers and the other war vessels ordered by the home Government in forward stages of construction, and at the company's wharf there are several vessels being fitted out for sea. There are also vessels under repair in the graving docks, &c., and on the whole it may be said that, not for a considerable time has the company been so uniformly busy throughout the various departments.

Messrs. Armstrong, Mitchell & Co.'s yards at Elswick and Low Walker are showing undiminished briskness, the war vessels for the home and foreign Governments contributing largely to the exceptional fulness of work at both establishments. Messrs. Wigham Richardson & Co.'s yard, and also Messrs. Dobson's establishment, continue to be well employed, and at Messrs. Wood & Skinner's yard, Bill Quay, it is understood that business is improving.

Messrs. Hawthorn, Leslie & Co. have just completed the equipment of the magnificent Russian volunteer steamer *Kherson*, which cannot fail to reflect credit upon the builders and the district where she was built, wherever her fine proportions come under examination. Her speed trials proved her to be as fast as she is handsome in appearance, and taking into account the elaborateness and completeness of her interior fittings, it is not too much to say that she will bear favourable comparison with almost any vessel of equal size afloat. The firm have still several important vessels in progress, and there is little fear of even a temporary slackness occurring during the present year.

The building berths of Messrs. C. S. Swan & Hunter's yards, are fully occupied with vessels in various stages of construction, and in the initiatory departments business is still showing a satisfactory degree of briskness. The Tyne Shipbuilding Co. also continue to have as much work as they can conveniently deal with, and Messrs. Readhead are at least equally well off, so far as regards the number of contracts in hand. In the smaller yards business is fairly active, but repairing establishments are not employed to the full extent of their resources. The building of ships' boats is becoming almost an extinct industry on the Tyne, the reason being that steel boats manufactured on new principles are to a large extent superseding boats made of wood.

Engineering.—Now that the trouble regarding engineers' wages has been disposed of, it may be assumed that nothing further will occur, during the present year at all events, to disturb the ordinary course of business in the engineering trade. The whole of the large marine engine works between Newcastle and Shields may be said to be well supplied with orders, and in one or two instances the pressure of work is quite exceptional. The Palmer's Co., for instance, have at the present moment, under construction in their boiler department, no less than 42 water-tube boilers, a fact which significantly indicates the prosperous state of business in their engineering departments. These boilers, it may be added, are all on the principle of Reid's patent, which has proved so eminently successful in connection with torpedo-boat equipment. At the Neptune Engine Works (Messrs. Wigham Richardson & Co.'s) there is now in progress, in addition to other work, a contract of a unique kind, consisting of two sets of duplicate engines—or four engines in all—for an ice-breaker, building at the yard of Messrs. Armstrong, Mitchell & Co. The marine and locomotive engine works of Messrs. Black, Hawthorn & Co., at Gateshead, were recently offered for sale, as a going concern, but were withdrawn, the reserve price of £40,000 not having been bid.

In the locomotive shops of Messrs. R. Stephenson & Co., South Street, Newcastle, business has improved. There is no work in the marine department, but the shops set apart for the manufacture of the "Rocket" oil engine are kept busy, the demand for that speciality being active. In the iron foundry connected with the establishment there is a large amount of work in hand.

Messrs. Noble & Lund, of the Northern Machine Tool Works, Felling, are well supplied with orders for their various specialities, among which may be particularised their well-known hand-saws for cutting iron or steel cold, as also their special types of drilling machines, lathes, piston rings, &c. The firm are steadily extending their business connection both at home and abroad, and it is satisfactory to know that a large proportion of the work now in hand consists of repeat orders, from engineering, shipbuilding and boilermaking firms, of the highest standing.

Messrs. Robt. Bowran & Co., of No. 3, St. Nicholas Buildings Newcastle, the well-known agents for the sale on the North-East Coast of magnolia metal, and other engineering specialities, have had very marked success in extending the sale, in this district, of the "Karmal" packing, manufactured by the Frictionless Engine Packing Co., Limited, Manchester. This packing, which has secured the highest awards wherever exhibited, is said to be the most economical in use. The confidence of the manufacturers in its effectiveness is shown by the fact that they announce themselves as willing to send trial lots on application, free of charge

Messrs. Ernest Scott & Mountain, Limited, of the Close Works, are just now very busy with the manufacture of their special types of auxiliary engines for war and mercantile vessels, and in their electrical departments business is also brisk. Very recently the works have been almost doubled in extent, yet the vastly-increased productive capacity does not seem to be in the least beyond current requirements.

The great works of Messrs. John Spencer & Sons, at Newburn, are now very fully employed in all departments, the boiler-plate rolling mill being especially brisk. At the firm's Ouseburn Forge Works a number of important orders have been secured.

Mr. W. F. Snowdon, of No. 2, Side, has just completed the covering of the boilers, steam pipes, &c., of the last vessel launched by Messrs. Hawthorn, Leslie & Co. for the Russian Volunteer Fleet. This is a large vessel of what is called the "cargo type"; but it is as handsomely-designed, and as well equipped, as many passenger vessels. Mr. Snowdon enjoys a high reputation for the effectiveness of his non-conducting boiler-covering compositions, and is usually kept busy on local contracts. To meet the requirements of customers at a distance, he manufactures a special composition, which, for convenience of transit, as well as to reduce cost of carriage, is sent away in a dry state, and this, it is stated, possesses qualities which render it admirably adapted for the purposes intended.

Messrs. George Angus & Co. continue to do a large business in the manufacture of marine engine and other packings, as also rubber valves, washers, &c., for home consumption and export, and their extensive works are kept in active operation.

THE WEAR.

Shipbuilding.—Messrs. Short Brothers have just added to their extensive shipbuilding premises at Pallion, the adjacent yard, which was formerly occupied by the North of England Shipbuilding Co. In acquiring this additional ground, the firm are understood to have in view the building of vessels of a larger type than they have hitherto been in the habit of dealing with, and owing to the circumstance that the berths run almost parallel with the stream, it will be quite possible to put down boats up to 500 ft. in length. The recently-acquired yard is also admirably adapted for repairing and fitting-out vessels, as there is a good stretch of river frontage where a number of vessels can be moored alongside without inconvenience. The construction of a suitable quay wall is the first improvement that will be made by the new proprietors, and this will be followed by the erection of a gangway for purposes of communication with vessels in the water. New machinery of the best type will be put down as soon as the necessary shops and other buildings are provided, and the firm will rely exclusively on electricity as their motive power. It is understood that the firm contemplate eventually having the whole of the machinery in the yard with which their name has hitherto been identified, as well as the machinery in the recently-added yard, driven by electric motors. At present the firm have a large amount of work in hand, and it is said that there is more in preparation.

Messrs. Doxford have laid the keels for two 30-knot torpedo destroyers which have been ordered from them by the Admiralty, and they have besides three large turret ships on the stocks. It is stated that they have recently received an order for two turret ships of large capacity from Messrs. Petersen, Tate & Co., of Newcastle. Messrs. Osborne & Graham have booked one or two orders, and their yard, which has been practically inoperative for a time, is again showing evidences of business, or at all events, of preparation. The small yard on the opposite side of the river (at South Hylton) is also in operation, there being one vessel on the stocks. Messrs. Priestman & Co. have all their berths occupied, the reverse condition being noticeable at the yard of Messrs. Pickersgill. Messrs. Robt. Thompson & Sons, who last month had but one vessel in progress, are laying the keel for another, and frame material is being received.

The sawmill and joinery department at Mr. Laing's yard, which, as noted in last month's issue, was partially destroyed by fire, has now been fully reconstructed and re-equipped, with the result that work operations have been resumed on a scale of great activity. The first of four twin-screw steamers, which Mr. Laing is building for a Russian syndicate, has been launched, and is now being fitted out in the Deptford Dock. This vessel has been built in an exceptionally short time, the keel having been laid in March. Though comparatively small the vessel is of superior type, having an unusually large proportion of intricate work below the decks, and to put such a vessel off the stocks in a couple of months from the laying of the keel, is an achievement highly creditable to the management.

Messrs. J. L. Thompson & Sons have again all their berths occupied, and night work is being resorted to in the frame-turning department. This argues well for abundance of work in the outside departments during the remainder of the year, more especially as the vessels now being laid down or in course of framing are of a large class.

Messrs. Blumer & Co. are busier now than for some time past, there being three vessels in course of construction, one of which is a passenger boat of good size. At the Sunderland Shipbuilding Co.'s yard there is at the moment little doing, the only vessel of large size on the stocks being one ordered for the Australian trade. Messrs. Bartram & Sons are also rather slack just now, though it is hoped the normal state of steadiness will soon be restored. Repairing establishments are not at present particularly busy.

Engineering.—At the Palmer's Hill Works business has improved considerably within the past few weeks, and it is known that there are some good contracts in hand. The s.s. *Cyprus*, which has been purchased by Mr. T. Y. Short from Messrs. Taylor & Sanderson, has been at the quay getting her old boilers and cylinders taken out to make room for new boilers of greater capacity, which will be supplied by Messrs. Dickinson & Sons. The firm will also fit the engines with new cylinders, and otherwise overhaul and repair them. During the past few weeks a large number of vessels have been fitted with Dickinson's patent crank shaft.

At the Southwick Engine Works business is very active, and a night shift is maintained. The North-Eastern Works, South Dock, are also busy, a remark which applies with equal accuracy to the company's works at Wallsend. Messrs. W. Allan & Co., of the Scotia Engine Works, have a fair amount of work in progress, and at Messrs. Doxford's establishment the state of business is satisfactory.

In the smaller engine works business is generally steady, and both iron and brass foundries are kept busy. A huge business transaction, resulting in the transfer of fourteen collieries in Durham, and nineteen coal-carrying steamers of an aggregating tonnage approximating to nearly 10,000 tons, from the proprietorship of the Earl of Durham, to that of Messrs. James Joicey & Co., Limited, Newcastle, has just been consummated. The latter company had already possessed thirteen collieries and thirty steamers of a total tonnage amounting to 16,000 tons, so that they will now have a larger coal producing area, and greater coal-carrying power than perhaps any firm in the world. They will also have at their command the coal shipping facilities at Tyne Dock, Dunston and Sunderland, and have in addition 300 coke ovens for the manufacture or production of coke. They are on the whole a stupendous company and as such are a fitting product of the age.

The Hartlepools.—The shipbuilding yards are still rather short of work, which is a very unusual state of affairs at this centre. The engineering works of Messrs. Thos. Richardson & Sons continue to be well employed, and at the Central Engine Works business is also satisfactory. A new departure has recently been made at these works by the fitting of a large vessel with engines having five cranks. The experiment has attracted much attention in this district, and the results in actual work will doubtless be awaited with interest.

Stockton.—A good deal of inconvenience has been caused at Messrs. Blair & Co.'s and other engineering establishments by the strike of engineers, which lasted a fortnight. Contracts have been necessarily delayed, and it will now be found requisite to put on some pressure to make up for lost time.

Middlesbro'.—Messrs. Railton Dixon & Co. have received from Messrs. John Cory & Sons London, an order for a large steamer to be employed, it is understood, in the coal trade. Messrs. Braggs & Sons have launched a vessel from their new yard, and appear to have now got fully under way, after their removal. Mr. Grant Barclay, who for some years has been connected with the firm of Messrs. Harkess & Sons, has removed from Middlesbro' to take a position as managing director of the shipbuilding department in a newly-formed shipbuilding and engineering company at Dundee.

Darlington.—At the works of the Darlington Forge Co orders are still plentiful, and the whole of the machinery is kep in steady operation.

THE MERSEY.

(From our own Correspondent.)

THE position with regard to the general trade outlook of this district remains very much as reported last month. In pig-iron there is a continued absence of buying of any weight going on, and prices have been gradually but steadily receding, representing reductions, in some brands, of 1s. to 1s. 6d. per ton. The finished-iron trade, however, remains fairly steady, although in this direction also there is less work coming forward. The steel trade is maintaining a tolerably strong position, especially in some descriptions of manufactured goods, but steel plates, either for shipbuilding or boiler-making purposes, do not move upwards, as had been anticipated, and merchants are still undersellers. With regard to the general engineering industries, activity is fully maintained in practically all departments. The leading machine tool-makers are very busy, especially upon heavy work for shipyards, whilst in all descriptions of machine-tools there has been a considerable enquiry coming forward, with a large amount of work placed. The improvement in the boilermaking trade is also being well maintained, works in this district being fully supplied with orders, and stationary engine-builders, both in the light and heavy departments, are kept well engaged upon work in hand, and with orders that will carry them forward for some time to come. Locomotive builders have also been securing considerable orders recently, the Vulcan Foundry Co. having received one for 16 locomotives for the Eastern Bengal Railway, and another for 20 goods engines similar in type to others they have already in hand for the North Western Railway Co. of India.

The usual employment returns of the engineering trades unions again bear evidence of the improvement in trade generally, a further decrease being reported in the out-of-work list. The Amalgamated Society of Engineers has now only 2½ per cent. of the total membership on donation, whilst in this district there are only 1¾ per cent. of the local membership in receipt of out-of-work support, the state of the unemployed list being better than it has been since 1890. The Steam Engine Makers Society reports not more than one per cent. of the membership on support, and this would have been further lessened but for the dispute on the North-East Coast. The reports as to the state of trade continue very satisfactory, most of the shipbuilding centres being exceptionally busy.

Messrs. Laird Bros., of Birkenhead, who continue busy on work in hand, have, during the month, launched from their works the *Teniente Serrano*, which is the third of the 30-knot destroyers on order for the Chilian Government, this being the seventh 30-knot destroyer launched by the firm during the last eight months. H.M.S. *Sparrowhawk*, one of the 30-knot destroyers built by the firm for the Admiralty, arrived at the Clyde during the month after a most successful trial passage of over 200 miles, which it accomplished at the rate of 30 miles, or 25 knots, per hour, and notwithstanding the high speed attained, the vibration was not more than that of an ordinary corridor train.

The annual report of the Amalgamated Society of Engineers, which has been issued during the past month to the members, records very satisfactory progress, both numerically and financially. The membership has increased by 3,624, and reached a total at the end of 1895 of 79,134, and the number of branches was 554. The total income for the year reached the unprecedented sum of £296,959, or £28,588 more than in 1894, and the expenditure was £278,696, or £2,828 less than the previous year. Donation benefit cost £108,947, or a decrease of £30,028, which would, the report states, have been more marked but for the "social war" at the end of the year. Sick benefit reached £45,726; superannuation £58,990; contingent benefits £8,108, an increase of £5,620; benevolent grants, £3,867; management expenses, £22,466, or 5s. 8d. per member. They commenced the year with a balance of £160,093, which was now increased to £169,577. The total worth of the society was £206,115. The unemployed list had shown a steady decrease throughout the year, except during November and December, when the Belfast and Glasgow disputes were being fought out, and even then the number on benefit did not get to as high a level as during the same period in 1894. In conclusion the general secretary (Mr. Anderson) refers briefly to the stirring events in connection with the above disputes, and remarks that the society encouraged and helped forward the movement for a restoration to the operatives in the above centres of the wages ruling prior to bad trade setting in, which policy had been initiated in other districts as well, owing to the returning prosperity in trade. The society was making wonderful progress, and since the close of the year had reached a total of 80,208 members, and the secretary enjoins upon the members the necessity, during what promised to be a period of prosperity, of never forgetting that moderation in their demands which had ever characterised them.

Messrs. Hulse & Co., of Salford, have just completed a universal vertical shaping and slotting machine, specially designed for dealing with armour plates. The machine, which weighs upwards of 120 tons, admits 14 ft. between the uprights, and has a table 17 ft. long, whilst the slotting table can cut through a thickness of 30 in. A special feature is that it will slot at any angle of 45 degs. out of the vertical plane, either transversely or longitudinally.

An improved forced draught arrangement for undergrate blowers has been patented by Mr. J. K. Broadbent, of Salford. This apparatus consists of a mouthpiece of trumpet form, which is supplied with a small jet of steam. This carries in a large quantity of air, and increases the draught through the fire-bars. The steam used for producing the draught also assists in keeping the bars cool, and is finally, after accomplishing its work, converted into water-gas and burned, thus giving back to the boiler the same amount of heat which was absorbed during its conversion into steam. With the increased draught so produced the fire necessarily burns much brighter and clearer than would be the case with a defective draught through the fire. By this arrangement the steaming capacity of both land and marine boilers can be greatly increased, whilst there is also a considerable saving in the cost of coal, as cheap fuel can be used instead of the best coal, and perfect combustion is secured even with a defective chimney draught. No special form of furnace bars is necessary, nor is it requisite to enclose the ash-pits. The furnace fire can be forced and slackened at will, the whole air supply being under absolute control; and a point in the new arrangement which will be much appreciated is a diminution in the quantity of clinkers produced.

Maybrick & Ashworth, Dickenson Street, Manchester, have brought out a patent safety apparatus for application to lifts and elevators, which is so arranged that, in case the rope of the hoist should break, the motion of the cage is immediately stopped. The attachment consists of a wedge under the control of a governor arrangement. When a breakage occurs the hoist necessarily descends at an increase upon the normal speed, and this causes the balls of the governor to expand, and, acting on a lever, bring the wedge in contact with the guides, thus stopping the descent of the cage. When the hoist is in motion a stationary rope which is placed over the pulleys serves to drive the governor by frictional contact, one of the pulleys being adjustable to impart the required tension to the rope. The apparatus is perfectly automatic in action, its operation being simply dependent upon the working of the governor and wedge, so that whether the accident arises from the breaking of the rope, or of any part of the hoisting mechanism, the cage is immediately held securely in the position which it occupied at the moment of the accident. Another advantage is that when the necessary repairs have been executed after the occurrence of an accident, work can be immediately resumed, as the apparatus, in acting, does not injure the slides or any other part of the lift.

An improved form of pump (Moss's patent), which is suitable for use on board ship, is being introduced by the Patents Co., Market Street, Manchester. The interior of this pump is lined with a special anti-freezing substance, so that there is no risk of the pump becoming useless during the winter season on account of the frost. An ingenious device is also introduced in the Moss pump, whereby it can be used as a force pump, if required. This consists of a small india-rubber ball which, under ordinary conditions, rests in a socket at the extremity of the discharge pipe, but which can be readily pulled down over the orifice if desired, and the water will be forced to pass through a small outlet at the top of the pipe, to which can be attached an ordinary hose, so that the water can be carried to any distance, and used for cleaning purposes. The pump can be quickly re-converted, when necessary, from a force pump to a common pump, all that is required being simply to move the ball from the top of the orifice into the socket at the end of the discharge pipe.

In the iron trade business all through the month has been very inactive, both as regards raw and manufactured material, with a continued weakening tendency in prices. For pig-iron only a very limited demand is reported generally, and makers have in some cases shown a giving way upon late quotations, whilst merchants and dealers, who are evidently over-bought, are pushing iron on the market at considerably under makers' quotations. Local pig-iron makers have held firmly to their quotations of 46s. 6d. less 2½, for foundry qualities, but in forge numbers there has been scarcely anything doing to really test prices. In district brands, Lincolnshire makers have had to reduce their prices for forge iron 6d. per ton, but foundry qualities are unchanged; the quotations are now 40s. 6d. for forge to 43s. for foundry, net cash, delivered Manchester. Derbyshire foundry has also given way during the month, 45s. 6d. to 46s., net cash, being now the average figure for delivery here. Outside brands have eased down considerably, merchants and dealers being very low sellers. Delivered by rail Manchester ordinary G.M.B. Middlesbrough could now be bought at 45s. 4d. to 45s. 7d. although makers are quoting 46s. 4d., whilst at the Docks as low as 44s. would be taken. In Scotch iron Eglinton is obtainable at 46s. and 46s. 3d. delivered ports, and 48s. 6d. delivered Manchester Dock Quay, whilst for Glengarnock, although makers' official quotations are 49s. 9d., delivered Ship Canal, Manchester, 48s. 6d. at Preston, and 47s. 6d. other Lancashire ports, there are ready sellers at 9d. under these figures.

In finished iron business has not been coming forward so freely, and forges are scarcely so well employed. Prices for bars are without quotable change, although one large concern, who have had to close a portion of their works owing to the decline of shipping trade, are rather slow sellers. Lancashire bars generally remain at about £5 10s., and North Staffordshire qualities £5 12s. 6d. to £5 15s. Sheets are weaker and are obtainable from £6 17s. 6d. up to £7 2s. 6d. and £7 5s., according to quality. Hoops remain at £6 2s. 6d., for random to £6 7s. 6d. for special cut lengths, delivered Manchester district, with 2s. 6d. less for shipment.

A moderate demand comes forward in the steel trade, and although merchants undersell, makers are firmly maintaining late rates. For hematites makers still quote 58s. less 2½, although merchants would take 6d. to 9d. less; and steel billets average £4 7s. 6d. net cash. In some classes of manufactured goods a fair enquiry is reported, with better prices obtainable, steel bars being now quoted £6 2s. 6d., but boiler plates remain at £6 5s. to £6 7s. 6d. delivered here.

In the metal market a brisk enquiry is stirring generally, with manufacturers well employed, and list rates, although without quotable change, show a hardening tendency. Delivered Manchester district, prices are as under:—Solid drawn brass boiler tubes, 6½d.; solid drawn brass surface condenser tubes, 7¾d.; solid drawn copper tubes, 7¾d.; brazed copper gas and steam tubes, 7½d.; brazed brass gas tubes, 7d.; brass wire 5¾d. to 6d.; copper wire, 6d.; and rolled brass, 5½d. to 5¾d. per lb.

Business in the timber trade has been fairly satisfactory, with imports moderate, and prices steady. The deliveries have been fully up to the average, and the new import season opens with light stocks. For East India teak there is more enquiry, and a considerable advance in prices has been established; stocks are moderate. Greenheart is in active demand, and as stocks are light prices, should move upwards.

The coal trade drags on but slowly, and with the close of the month the Whitsuntide holidays necessarily interfered with business operations, pits being mostly closed over the full week. Housecoals have been in but very limited demand, and prices, although without quotable change, are easier, concessions being made to secure orders of any weight. Steam and forge coals still move off slowly, with supplies excessive, and prices as low as ever. Engine fuel meets with a ready sale, with better prices obtainable, but extra supplies coming in from other districts prevent any really general advance. At the pitmouth it is exceptional where more than 9s. 6d. is obtainable for best Wigan Arley; 8s. for Pemberton four-foot, and seconds Arley; 6s. 6d to 7s. for common housecoal; 5s. 6d. to 6s. for steam and forge coal; 3s. 3d. to 3s. 6d. for common slack; and 4s. 3d. to 4s. 9d. for best sorts.

Shipping prices show no improvement, and 6s. 9d. to 7s. 3d. delivered Mersey ports, continue the full average figures for ordinary steam coal.

BELFAST TRADE NOTES.

(*From our own Correspondent.*)

THE shipbuilding and engineering trades in Belfast have been characterised by great activity during the past month. This state of affairs, of course, naturally leads to a desire on the part of the men to share in some measure in the increased prosperity and to "make hay while the sun shines." The engineers, it is said, are again on the war path, and unless an agreement can be come to we may witness a repetition of the sixteen weeks idleness, with its attendant misery, so lately passed through, but, seemingly, already forgotten. Needless to say, this would be disastrous at the present time. Matters, however, have not by any means reached an acute stage yet, and no doubt arrangements will be come to which will prevent any ill-feeling at this time.

A fair amount of tonnage has been put through hands during the month. The first vessel to be mentioned is the t.s.s. *Canada*, the latest addition to the Dominion Line Fleet, which was launched from the north end of Messrs. Harland & Wolff's yard early in the month. This fine steamer has a gross tonnage of nearly 9,000, and will, it is said, eclipse anything trading to Canada. She has been built to carry a large number of both first and second class, as well as steerage passengers. The saloon is capable of seating over 200 persons, and is tastefully decorated with the crests of the principal cities in the Dominion. The other accommodation is up-to-date in all requirements, including electric light throughout, refrigerating machinery, &c. The vessel will be fitted with powerful twin-screw triple-expansion engines of the latest type. Messrs. Harland & Wolff will also launch on the 28th inst. a passenger steamer for cross channel service between Liverpool and Belfast. The t.s.s. *Iran*, just completed by the same firm, had a successful trial trip in the Lough, and, after adjusting compasses, proceeded to Liverpool.

The s.s. *Istrar*, for the same owners, viz., Messrs. Bates, Liverpool, is rapidly approaching completion, and will shortly follow suit.

Messrs. Workman, Clark & Co. intend having a double event on Wednesday, 27th inst., when they will run the trial trip of the s.s. *Langton Grange*, and on the same day launch a sister ship, the *Denton Grange*, for the same owners, viz., Messrs. Houlder Bros., London. A numerous company is expected to be present on the occasion, and after witnessing the launch they will be transferred to the *Langton Grange*, which will then proceed down the Lough to the measured mile. After the trip she will sail for Newport (Wales) to load for Brisbane, Australia.

The Union Co.'s *Scot* was undocked on the 2nd inst., after being lengthened, and is now being re-painted and otherwise touched up. The vessel will, when finished, present an even finer appearance than before she arrived here.

The first consignment of the main engines and boilers o the s.s. *Hannibal* will leave here about the beginning of June for Pembroke, per specially chartered steamer.

A considerable extension to the erecting shops of Messrs. Harland & Wolff's engine works is now in hand. A large portion of the quay adjoining the Abercorn basin has also been let to the shipyard by the Harbour Commissioners, as at the present time the work is hampered somewhat owing to insufficient room when a number of large steamers are in the water.

A rumour is in circulation here that a regular leviathan in the way of steamers will shortly be laid down here. The vessel, it is said, will exceed in size anything yet attempted.

The old paddle steamer, *Prince of Wales*, which formerly plied between Fleetwood and this port, has been sold to a London firm. The service is now being conducted entirely by the new twin-screw boats.

NORTH-WEST OF ENGLAND.

(*From our own Correspondent.*)

Barrow.—There has been no material change in the shipbuilding and engineering trades of this district during the month. A steady tone of activity has been maintained, and nearly every department in local yards and workshops has been fully maintained. There is evidence, however, of the need of orders to follow on, as some of the initial branches of trade, those in which new orders first find work, are running short of employment, and until new orders come to hand there will be gradually fewer men employed in these departments. Only one order has been booked during the month by the Naval Construction and Armaments Co., that for a channel steamer of high speed, for the Barrow and Belfast service of steamers, and the Barrow and Douglas service in the summer months. The new vessel will be named *Duchess of Devonshire* in compliment to the Duke of Devonshire, the chairman of the Furness Railway Co., which is one-third owner of the Barrow Steam Navigation Co.'s vessels, the other owners being the Midland Railway Co. and Messrs. Jas. Little & Co., the latter being managing owners. The *Duchess of Devonshire* will be a twin screw, and have a speed of 19 knots. She will thus be able to spin over to Belfast from Barrow in a little over six hours, and will cover the distance from Barrow to the Isle of Man in a little over two hours. Barrow is the shortest route to the Isle of Man, and the need of a fast steamer has been demonstrated for years. The *Duchess of Devonshire* will be fitted up with all modern improvements, and her cabins and sleeping accommodation will be of a luxurious character. She will do very much, it is expected, to popularise the Barrow route. It is noteworthy that although the Barrow Steam Navigation Co. has been in existence since 1867 this is the first order that has been given out locally for an addition to the fleet. Previously the new steamers for the line have been built on the Clyde and at Liverpool. The N.C. and A. Co. has been making wonderful progress with the work on hand. The *Powerful* is all but completed, and her steam dock trials were fixed to come off in Whit-week in the Buccleuch Dock. Her boilers and engines are completed and the shipbuilders' work in the vessel is almost concluded. When it is remembered that this is the first first-class cruiser ever built at Barrow it is a noteworthy fact that the order, placed in January, 1894, will be completed in June, 1896, or half a year within the specified time for delivery. A fact like this does much to give assurance to the country, not only of the great capacity of private yards, but of the speed with which they can turn out even large orders like those of vessels of 14,200 tons. The second-class cruisers *Juno* and *Doris* are both so far forward towards completion that delivery can be made in the autumn, and possibly the *Juno* will take her trials before the August Bank Holiday. Much attention is at present being centred on the construction of the four topedo-boat destroyers in hand at Barrow, the *Amy*, *Bittern*, *Otter*, and *Leopard*. The first two are well in frame, and will soon be ready for launching, the order for the last two was only received last month. The first-class cruiser *Niobe* is beginning to lift her mighty sides, and probably she will be sufficiently well forward to be launched in about a year's time. The only other work the Barrow Co. has in hand at present is that of the Clan line steamer *Sutherland*, which is well in frame. There are hopes of further commercial orders, the market having recently been rather more active, but prices have kept low, and only in cases of very cheap quotations have orders been given out. The prospect of the proposed Canadian Atlantic fleet being built is more promising than for some time past. In the accepting and progress of this idea the Barrow Co. have been to the front from the days of the late Mr. Bryce Douglas, who during his lifetime made two voyages across to America in the interests of the Barrow Co., and Mr. Adamson, the present managing director of the N. C. & A. Co., has also been in Canada with reference to this proposed fleet of steamers. It is believed when the order is given out for the building of the four 20-knot 8,500 liners is given out, Barrow will at any rate be one of the places at which some of the vessels will be built. It will be remembered the order for the three *Empresses* on the Pacific station which have given such general satisfaction to their owners and the travelling public were built at Barrow. It is expected that Barrow builders will secure some of the orders yet to be given out this year by the Admiralty.

West Cumberland.—The shipbuilding trade in West Cumberland remains steady and brisk, and both at Workington and Maryport there is a prospect of the continuance of the activity which exists.

Shipbuilding Material. — The demand for shipbuilding material is well maintained, and the plate mills are especially busy, in fact makers cannot accept all the orders that are offered on terms of early delivery. Plates are still quoted at £5 2s. 6d. per ton. Heavy steel castings are in brisk request, especially for ship work, and orders are very plentifully held. The foundries are working overtime. Angles and other classes of ship steel are in good demand.

Hematites.—The hematite pig-iron trade has been steady through the month, and the better demand which set in some months ago has been maintained. About 30,000 tons of pig-iron is produced every week, all of which is going into consumption, most of it on steel-making account. Stocks still represent about 300,000 tons of metal. Prices are steady at 49s. to 50s. per ton for mixed Bessemer Nos. net f.o.b., and warrant iron is at 47s. 3d. net cash sellers, and 47s. 2½d. buyers.

Shipping.—The shipping trade has shown a slight improvement during the month, and the tonnage of exports of pig-iron and steel has gone up. Freights are, however, at low and unremunerative prices. The cause of this is explained to be the large amount of shipping idle.

Strike of Joiners.—A strike of joiners has occurred at the Barrow Shipyard, and 200 men have left work on the question of some jobs being done by the carpenters which they claim to belong to their branch of trade. The joiners and carpenters some time ago, it is understood, arranged when any dispute of this sort arose it should be submitted to the management of the company in order to avoid any stoppage of work, his decision to be temporary until the executive of the two societies had come to terms. But a strike has arisen, nevertheless, and work in this department is at a standstill, except so far as apprentices are concerned. The question in dispute is not a difficult or serious one, and it is believed soon after the Whitsuntide holidays a settlement will have been arrived at.

The Proposed Armour Plate Works for Barrow.—The proposal to establish large armour plate works for Barrow is progressing satisfactorily, and the scheme is being backed by men of large capital, who have satisfied themselves that Barrow is a place highly suitable for the successful working of this industry. There is at present a very brisk demand for armour plates, and that is likely to grow and increase with the development of naval power at home as well as abroad. Barrow is known to possess exceptional facilities for this trade in the fact that steel is at her very door, and there is always cheap water carriage to be had to ports anywhere at which war vessels are built.

Miscellaneous.

The Institution of Junior Engineers.—At a meeting of this Institution held at the Westminster Palace Hotel, on 17th April, a paper on "Dredgers" was read by Mr. J. W. Hunter, member. The chair was occupied by Mr. H. B. Vorley, vice-chairman. In dealing first with the question of design, the author gave as the principal affecting considerations:—(*a*) whether the dredger was required to work in smooth water, or in a sea way; (*b*) the draught of water available to commence operations; (*c*) the depth of water to which the dredger was to work: (*d*) mode of delivery of spoil, whether by ordinary shoots into barges alongside, by a travelling belt, by means of pipes, or over the stern by a travelling belt or long shoot. After indicating the merits and objections of single and double ladder dredgers, and of open and closed wells, a description was given of the usual type of engine employed. It was very necessary to fit the bucket driving gear with some sort of friction apparatus, arranged to give way when any heavy obstruction was encountered. The shape and make of the buckets, and of the bottom and top tumblers, and parts of gearing, were next considered. The second part of the paper contained particulars of construction of ordinary bucket ladder dredgers, of hopper dredgers, and of other classes of dredgers, including sand pump, grab, pneumatic, land, and spoon and bag. Reference was also made to machines for unloading barges by means of a bucket ladder with dredger action. Detailed descriptions followed of two dredgers presenting novel features, built by Messrs. Hunter & English, one for the Peruvian Corporation, and the other for the Leeds and Liverpool Canal Co. The cost of dredging was shown to vary with conditions of working, instances being given of a light-draught dredger in Spain, 1·8d. per cubic yard; on Lake Copias, Greece, with coal at 45s. per ton, 1·3d. per cubic yard; on the River Trent, 0·34d. per ton, the price in each case not including first cost of dredger and depreciation. A discussion followed the reading of the paper.

Holzapfel's Compositions.—We have pleasure in noting, from a return furnished us by Holzapfel's Composition Co., Limited, that the company's agents supplied their well-known compositions to no less than 2,546 ships, representing a gross tonnage of 4,430,574 tons during last year. These figures show, as compared with 1894, the very satisfactory increase of 55 vessels and 316,464 gross tons. In addition to the large quantity of composition represented by the coating of the above vessels the company have supplied direct, and in bulk, many foreign governments, steamship owners and merchants from whom unfortunately no returns are forthcoming as to the number and tonnage of the vessels coated.

Institution of Naval Architects.—The following papers will be read at the summer meetings of this Institute in Hamburg and Berlin, viz.:—"The Maritime Position and Principal Features of the Port of Hamburg," by Herr F. Andreas Meyer, engineer-in-chief of the City of Hamburg; "Shipbuilding in Germany," by Herr C. Ferd Laeisz, chairman of the Hamburg Chamber of Commerce, associate; "Recent Improvements in Shipdocking Appliances," by Lyonel Clark, Esq.; "Development in the Design and Construction of German Men of War," by Herr A. Dietrich, constructor-in-chief of the German Navy, member; "The Classification and Relative Power of Warships," by F. Elgar, Esq., LL.D., F.R.S.E., vice-president; "On Signs of Weakness in Tank Steamers," by Herr Otto Schlick," member: "On various Descriptions of Doors, applicable to Water-tight Bulkheads, their Fastenings, &c.," by B. Martell, Esq., vice-president; "The Employment of Electricity on Board Ships," by Herr F. Eickenradt, inspecting engineer.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES.—English.

Zero.—Earle's Shipbuilding Co., Hull, have made a further addition to the Stettin and Copenhagen line of Messrs. Thomas Wilson, Sons & Co., of their town, in the shape of a fine steel screw-steamer, named the *Zero*. She is 250 ft. long, 30 ft. beam, by 18 ft. 1 in. moulded depth ; and being intended for the carriage of butter and other perishable cargo, she is fitted with a Hall's patent refrigerating plant and her main hold insulated and converted into a cold storage chamber. The vessel has a topgallant forecastle and a long poop, in the latter of which there is accommodation for 12 first-class passengers, besides quarters for the captain, officers, and engineers. The machinery is of the three-crank triple-compound type, with cylinders 18½ in., 31 in., and 53 in. diameter, by 33 in. stroke, and two boilers to work at 200 lbs. steam pressure.

Titania.—On April 24th there was launched from the Walker-on-Tyne shipyard of Sir W. G. Armstrong & Co., a steel screw steamer, built to the order of Messrs. Lars Krogius & Co., for the Finska Steamship Co., of Helsingfors. The chief dimensions of the vessel are:—Length, 290 ft. 6 in. ; breadth, 38 ft. ; depth, moulded, 22 ft. 7 in. The vessel has been built to Lloyd's highest requirements to their spar-deck rule. She is capable of carrying 2,500 tons deadweight, and was named *Titania*. The vessel will be fitted with triple-expansion machinery.

Iron Steam Tug.—On April 25th Mr. Henry Scarr launched at Beverley an iron steam tug, built to the order of Mr. Richardson, of Grimsby, and intended for North Sea towing. The dimensions of the tug are as follows:—Length, 82ft. ; breadth, 16 ft. ; depth of hold, 9 ft. 8 in. She will be fitted with engines of 250 H.P.

Imperialist.—On April 25th this vessel was launched from the yard of Messrs. William Doxford & Sons, Limited, of Sunderland, having been built to the order of Messrs. Angier Bros., London, under the superintendence of F. J. Pilcher, Esq., Liverpool

Jupiter.—On April 27th the steel screw steamer *Jupiter* was launched, built by Messrs. William Gray & Co., Limited, for Messrs. Schmidt & Hansen, of Flensburg, through Messrs. E. A. Casper & Co., of West Hartlepool. The steamer is intended for the timber and general cargo trades, and takes Lloyd's highest class, and her dimensions are :—Length, over all, 270 ft. ; breadth, 39 ft. ; depth, 18 ft. 2 in. She has a long, raised quarterdeck, long bridge, and topgallant forecastle, and houses on deck for cabins. The hull is built with deep framing and cellular double bottom, and the equipments will be of the most improved description, including patent donkey boilers, steam steering gear, four steam winches, &c. She will have triple-expansion engines, made at the Central Marine Engine Works of Messrs. Wm. Gray & Co., Limited, having cylinders 19 in., 30½ in., and 51 in., with a piston stroke of 36 in., and a large steel boiler to work at a pressure of 160 lbs. per square inch. The ceremony of naming the ship was gracefully performed by Miss Christina Baines, of West Hartlepool.

Perseverance.—On Monday, April 27th, Messrs. Allsup & Co. launched from their shipbuilding yard at Preston a steel twin-screw tug, built to the order of the Preston Corporation. The dimensions are:—Length, 120 ft. ; breadth, 22 ft. 6 in. ; depth, 11 ft. The boat, whose yard number is 158, was named the *Perseverance*, and is a sister ship to the *Enterprise*, and both are principal tugs for work on the river Ribble. The hull was towed straight under the crane to receive the engines and boiler. The boiler weighs 27 tons, and is 14 ft. 6 in. diameter ; the engines, two sets of compound surface-condensing, with cylinders 17 in. and 34 in. by 24 in. stroke, working at a pressure of 100 lbs., built by Messrs. Allsup & Co. Messrs. Allsup have another tug of similar dimensions in frame, and a paddle excursion passenger steamer of 130 ft. long well in progress, and a cargo steamer for the coasting trade ready for launching.

Veva.—On April the 27th Messrs. Ropner & Son, of Stockton-on-Tees, launched a steel screw steamer of the following dimensions, viz. :—Length between perpendiculars, 314 ft. ; breadth, extreme, 44 ft. ; moulded depth, 23 ft. 3 in., which they have built to the order of Messrs. George Pyman & Co., West Hartlepool. The vessel is built on the single-decked rule, "with freeboard," having half poop, bridge and topgallant forecastle, her deadweight carrying capacity being 4,100 tons on 19 ft. The saloon and cabins for captain and officers are fitted in the poop, the engineers' accommodation being under the bridge amidships. She is built on the web-frame principle, leaving the holds entirely clear for cargo, and carries her water ballast in a cellular bottom and in the after peak. All labour-saving appliances are fitted for the economical working of the steamer, and also for the expeditious loading and unloading of cargoes. She has steam steering gear amidship and screw gear aft, four powerful steam winches, two large donkey boilers, direct steam windlass, stockless anchors, &c. The engines wil work up to about 1,000 effective H.P., and are by Messrs. Blair & Co., having cylinders 23 in., 37½ in. and 61¼ in. by 39 in. stroke, steam being supplied by two large steel boilers working at 160 lbs. pressure. The name of *Veva* was given to her as she left the ways, the naming ceremony being performed by Miss Eva Pyman.

Hermes.—On April 27th Messrs. Wood, Skinner & Co. launched, at Bill Quay-on-Tyne, a steel screw steamer of the following dimensions, viz. :—Length over all, 247 ft. ; beam, 35 ft. ; depth moulded, 20 ft. 6 in. She has been built to the order of Messrs. Brunsgaard, Kjosterud & Co., of Dram, and is of the flush deck type with bridge and topgallant forecastle. The vessel has been built under special survey to Lloyd's highest class, and also to the highest class, viz., 1 A1* Norwegian Veritas, on whose behalf she has been surveyed during construction by Mr. Lauritz M. Bodin, of Sunderland, the local representative. The saloon, captain's accommodation and officers' berths are provided in the bridge amidships, while the crew are berthed in the topgallant forecastle. The vessel has a cellular double bottom for water ballast all fore-and-aft, and will be equipped with all the most modern improvements, including combined steam and hand steering apparatus amidships, screw steering gear aft, powerful steam winches, windlass, multitubular donkey boiler, &c. The main engines will be of the triple-expansion type, having cylinders 18½ in., 30 in. and 49 in. by 33-in. stroke, and these will be fitted by the North-Eastern Marine Engineering Co., Limited, of Wallsend. On leaving the ways the vessel was christened *Hermes*. Captain Carl Jensen is to take command of the steamer when finished.

Rubicon and Larchwold.—Messrs. Cochrane & Cooper launched from their yard, at Grovehill, on Tuesday, April 28th, a steam trawler, the *Rubicon*, built to the order of Mr. G. F. Sleight, of Grimsby. The vessel, which is classed 100 A1 at Lloyd's, is of the following dimensions:—Length, 89 ft. ; breadth, 20 ft. ; depth of hold, 10 ft. 8 in. She will be fitted with 40 H.P. triple-expansion engines by Messrs. C. D. Holmes & Co., of Hull. The ceremony was performed by Mrs. Emily Barker, of Grimsby.—On Wednesday, April 29th, the same firm launched for the Northwold Steam Fishing Co Limited, of Grimsby, a steam trawler of the under-mentioned measurement:—Length, 93 ft. ; breadth, 20 ft. 6 in. ; depth of hold, 11 ft. She was named the *Larchwold* by Miss M. J. Sowerby, of Cuxwold Hall, Caistor. Messrs. Amos & Smith, of Hull, will supply the engines of 35 H.P. The steamer is of Lloyd's 100 A1 class.

Kendal Castle.—On April 28th Messrs. William Pickersgill & Sons launched at Sunderland a steel screw cargo steamer of the partial awning deck type, which has been built to the order of Messrs. James Chambers & Co., of Liverpool. The vessel is of the following dimensions:—Length, between perpendiculars, 310 ft. ; breadth, 42 ft. 6 in. ; and depth, 21 ft. 9 in. ; and has been built to Lloyd's highest class as a partial awning decked steamer. The machinery and boilers are being supplied by Messrs. George Clark, Limited, of Southwick. The engines, which are of the triple-expansion type, have cylinders 21½ in., 36 in., and 60 in. diameter, with 42 in. stroke. The vessel was named *Kendal Castle* by Mrs. Chambers, wife of the owner.

Ararat.—On April 28th Messrs. R. and W. Hawthorn, Leslie & Co., Limited, launched at Hebburn-on-Tyne a steel screw steamer for the Black Sea trade. She is one of three vessels building by the company for the Russian Steam Navigation and Trading Co., of Odessa. Her dimensions are 220 ft. by 34 ft. by 14 ft. moulded, and she has a deadweight capacity of 1,100 tons. The machinery, with cylinders 16 in., 26 in. and 43 in. by 30 in. stroke, is being supplied by the company's St. Peter's Engine Works. The vessel was named the *Ararat*.

Flintshire.—On April 28th there was launched from the yard of the Sunderland Shipbuilding Co., Limited, a handsome screw-steamer, built to the order of Messrs. Jenkins & Co., of London, for their "Shire" line of steamers. The register length of the vessel is 364 ft.; breadth, register, 45 ft. 3 in.; and depth moulded, 30 ft. 6 in.; having large topgallant forecastle, in which are berthed the sailors and firemen; long bridge amidships, under which is provided accommodation for captain, engineers, officers, and a few passengers. The handsome saloon is tastefully fitted in polished oak, with tiled floor, and complete with every comfort. The full poop is entirely devoted to cargo. The vessel is constructed on the web-frame principle, thus dispensing with hold beams, and has cellular water ballast all fore and aft. The poop and bridge decks are of wood, the main and spar decks of steel, and all frames are of zed steel. Her class will be 100 A1 Lloyd's, spar-deck grade, special survey; also Board of Trade certificate. Her carrying capacity is 5,700 tons. The deck machinery consists of seven large steam winches and direct steam windlass, by Messrs. Emerson Walker & Co., Roger & Co.'s steam steering gear, which is placed in the engine-room and worked from flying bridge, together with all the usual appliances for handling cargo and working the ship with the greatest possible despatch. The main engines are upon the tri-compound principle, by the North-Eastern Marine Engineering Co., Limited, Sunderland, and have cylinders 25 in., 41½ in., and 69 in., by 45 in. stroke, steam being supplied by two large steel boilers working at a pressure of 180 lbs. per square inch. During construction the steamer has been inspected on behalf of the owners by Mr. C. E. Hudson, and upon leaving the ways was gracefully named the *Flintshire* by Mrs. Jenkins, wife of the senior partner, after which she was towed into the south dock for the purpose of masting and for shipment of her machinery.

Latona.—On April 29th there was launched the steam yacht *Latona*, of 265 tons yacht measurement, designed and built by Day, Summers & Co., of the Northam Iron Works, Southampton, for Baron A. W. von Knoop. The dimensions of the yacht are as follows:—Length, perpendiculars, 136 ft.; length on load water line, 135 ft.; breadth, 20 ft. 3 in.; depth, 13 ft. The engines are of the compound inverted surface-condensing type of 60 N.H.P., the cylinders being 18 in. and 35 in. diameter, by 24 in. stroke, and boiler 10 ft. 6 in. diameter by 9 ft. long; working pressure, 90 lbs. The owner's accommodation is fitted in the after part of the vessel, and consists of saloon immediately abaft the engine-room, five state cabins, bath-room, &c. The furniture and fittings of all the cabins are of solid oak. The yacht and machinery have been built to Lloyd's highest class under special survey, and the work has been carried out under the superintendence of Captain G. U. Diaper, who will be in command of the yacht.

Boxgrove.—On April 30th Messrs. J. Priestman & Co. launched at Sunderland a modern cargo vessel, built to the order of Sidney Ferneaux & Co., of London. The principal dimensions of this vessel are:—Length, 336 ft.; breadth, extreme, 47 ft.; and the moulded depth is 24 ft. 10 in., with a deadweight capacity of 4,900 tons. She has been built to Lloyd's highest class on the deep frame principle, and to semi-spar deck requirements. Her engines have been constructed by Messrs. Wm. Allan & Co., Sunderland, and are of the triple-expansion type, with cylinders 24 in., 40 in., and 66 in., with 45 in. stroke. There are two boilers of the single-ended type, designed for a working pressure of 160 lbs. per square inch. The vessel was named *Boxgrove*.

Lord Kelvin.—On Thursday, April 30th, Messrs. Bartram & Sons, of Sunderland, launched a large and finely-modelled steel screw steamer for Messrs. John Herron & Co., of Liverpool. The vessel is of the spar deck type, with long bridge covering engine and boiler openings, poop and topgallant forecastle. The following are the principal dimensions:—Length, 350 ft.; breadth, 45 ft.; depth, moulded, 26 ft. 9 in., with a carrying capacity of about 5,200 tons, on a very light draught of water. There are six watertight bulkheads, and the double bottom will contain about 800 tons of water ballast. The vessel is built on the deep frame principle, the hold beams being dispensed with and the holds being particularly clear of all obstructions, and suitable for general cargoes. The deck machinery consists of six large steam winches by R. Welford, direct-acting steam windlass by Emerson, Walker & Co., one of Riley Bros. multitubular donkey boilers, and steam steering gear by John Lynn. The saloon and captain's room are at the fore end of the bridge, and are handsomely fitted up in polished hardwood. The accommodation for officers and engineers is placed at the after end of the bridge. The crew have comfortable quarters in the forecastle, and the poop is fitted for light cargoes. The engines will be supplied by Messrs. J. Dickinson & Son, Limited, the cylinders being 24 in., 39½ in., 65 in., by 42 in. stroke, with two steel boilers 15 ft. 6 in., by 10 ft. 3 in.; 160 lbs. working pressure. In addition to the usual machinery there will be an evaporator and feed heater, steam ash hoist, duplex feed and ballast pumps, and other modern appliances. The vessel and her machinery are being superintended during construction by Messrs. Flannery & Tritton, consulting engineers of Liverpool and London. As the vessel left the stocks she was gracefully christened the *Lord Kelvin* by the Mayoress of Sunderland.

Pursuit.—On April 30th there was launched by Mr. James Miller, at St. Monan's, a fishing boat, built to the order of Messrs. Alexander Hutt (Allan) & James Wood, jun., St. Monan's. She is 64 ft. in length, and 19 ft. beam. She was named the *Pursuit* by Mrs. Hutt, the wife of one of the owners.

Verne.—There was lately launched by Messrs. Willoughby Brothers, Limited, at Plymouth, a steamboat named the *Verne*, for Messrs. G. H. Collins & Co., of Dartmouth and Portland. The steamboat is to be used as a tender on vessels arriving at Portland. The *Verne*, which was named by Mrs. Buckpitt, wife of Captain Buckpitt, of Dartmouth, who is the representative of the owners, is built of steel throughout. The length of the vessel over all is 70 ft. 6 in.; breadth, 13 ft. 6 in.; depth, 7 ft. 1½ in. The engines are compound surface-condensing, with cylinders 12 in. and 24 in. diameter by 16 in. stroke.

Charmian.—A schooner-yacht, built to the order of Mr. J. B. Atkinson, formerly owner of the cutter *Hoopoe*, was launched lately by Messrs. Fay & Co., at Northam, Southampton. The vessel is from designs by Mr. J. B. Soper, and is about 160 tons yacht measurement. She is composite, her frames being of steel, and she has been built under special survey to the highest class at Lloyd's for 20 years. Her principal dimensions are:—Length, 99·8 ft.; breadth, 20·35 ft.; depth, 12·3 ft. The yacht is named *Charmian*.

Taquary.—On Friday, May 1st, there was launched from the Cleveland dockyards of Sir Raylton Dixon & Co., Middlesbrough, a fine steel screw steamer, which has been built to the order of Messrs. The Hamburg South American Steamship Co., for their passenger and general traffic to Rio Grande, under the supervision of Mr. F. G. Dietze. This is the first of two sister ships which these builders are now constructing for the same owners. The vessel is of the spar deck type, and has been built under special survey for Bureau Veritas highest class, the principal dimensions being—Length, 310 ft. 6 in.; beam, 41 ft. 2 in.; depth, moulded, 26 ft, with a deadweight carrying capacity of about 3,960 tons on a light draught. The accommodation for first-class passengers is under the bridge, with dining saloon in house on bridge deck, all of which will be handsomely fitted up. Commodious and well ventilated quarters for about 326 emigrants are also provided aft in poop and 'tween decks. The decks are sheathed with teak, and all the fittings and accommodation are of a particularly complete and first-rate description. Triple-expansion engines will be supplied by Messrs. Thomas Richardson & Sons, Limited, Hartlepool, having cylinders 20 in., 33 in., 57 in., and 45-in. stroke, with two large boilers working at 205 lbs. pressure. The steamer on leaving the ways was named *Taquary* by Mrs. R. H. Harkness, of West Hartlepool.

Honoria.—On May 11th an iron ketch-rigged steamer of about 150 tons gross, named the *Honoria*, was launched at Hull, owned by Messrs. C. Hellyer & Co., Limited, Hull.

Kazbek.—On May 12th a steel schooner-rigged steamer of about 800 tons gross, named the *Kazbek*, was launched at Newcastle, owned by Russian Steam Navigation and Trading Co., Odessa.

Hawick Hall.—On Tuesday, May 12th, Messrs. Joseph L. Thompson & Sons, Limited, of the North Sands Shipbuilding Yard, Sunderland, launched the above-named finely-modelled steel screw steamer, built to the order of the Globe Shipping Co., Limited, of Liverpool, of which Messrs. C. G. Dunn & Co. are the managing owners. The principal dimensions are:—Length B.P., 356 ft.; breadth, extreme, 48 ft. 6 in.; depth, moulded, 27 ft. 4 in. The vessel is built on the spar-deck rules to Lloyd's 100 A1 class, under special survey, and is a fine example of a modern cargo vessel, with all the latest improvements. Water ballast is carried in a cellular double bottom, right fore and aft, and in the after peak. The whole of the officers' and engineers' accommodation is arranged in the bridge amidships, with a limited number of spare berths for the accommodation of passengers. The crew, firemen, and petty officers are berthed in the topgallant forecastle. The vessel is rigged as a two-masted fore-and-aft schooner, with telescopic topmasts to suit the Manchester Ship Canal. A large house is placed at the forward end of the bridge, used as an entrance hall to the saloon, steering-room, and chart-room, the steering gear itself being placed in the after end of the engine casing. A powerful screw gear is fitted at the after end of the vessel. A large galley, bath-rooms, and other sanitary requirements are placed in the bridge. There are four large cargo hatches, worked by five powerful steam winches, and forward is a patent steam windlass for the working of the stockless anchors. The vessel is replete with every requirement for the comfortable accommodation of the crew, and for the rapid handling of cargoes. The engines are by Messrs. Blair & Co., Limited, Stockton-on-Tees, the size of the cylinders being 25 in., 42 in., and 68 in., with a stroke of 45 in. Steam is supplied by three large cylindrical multitubular boilers, working at 160 lbs. pressure. The vessel was launched by means of hydraulic power by Miss Dunn, a sister of the managing owner; the christening ceremony being gracefully performed by Miss Edith Dunn, of Clare Mount, Wallasey, daughter of the managing owner. After the launch the company retired to the offices of the builders, where the usual toasts were duly honoured.

Ragnar.—On Wednesday, May 13th, Messrs. William Gray & Co., Limited, launched a fine steel screw steamer of the following dimensions, viz.:—Length, over all, 285 ft.; breadth, 39 ft. 6 in.; depth, 19 ft. She has been built to the order of Mr. L. H. Carl, of Copenhagen, and will take Lloyd's highest class. The deck erections consist of poop, raised quarterdeck, and partial awning-deck. A handsome saloon, state-room, and accommodation for captain and officers will be fitted up in the poop, and comfortable quarters for the engineers amidships, and for the crew forward. The hull is built with web frames and cellular double bottom, and with large ballast tank in the after peak. Four steam winches, large patent donkey boiler, steam steering gear placed in engine-room casing, hand screw steering gear aft, direct steam windlass, schooner rig, boats on beams overhead, grain divisions, and all improved appliances for working the steamer will be provided. The engines are of the triple-expansion type working on three cranks, and are from the Central Marine Engine Works of Messrs. William Gray & Co., Limited, the cylinders being 21 in., 33 in., and 56 in. diameter, with 36 in. piston stroke, and two large steel boilers to work at a pressure of 160 lbs. per square inch. The steamer has been superintended during construction by Captain C. A. Jorgensen, on behalf of the owner, and the ceremony of naming her *Ragnar* was gracefully performed by Miss Vera Nielsen, of Hartlepool, niece of the managing owner. Mr. Paul Carl, son of the owner, was also among those present at the launch. The *Ragnar* is a sister to the *Sigurd*, which gave such good results in her trial at sea.

White Cross.— On May 13th, Mr. Jarvis launched at Anstruther a steam liner, built to the order of the Anstruther White Cross Steam Fishing Co., Limited. She was named the *White Cross*. The vessel is 96 ft. in length over all, and is fitted up with all the latest improvements for deep-sea fishing.

Prudente de Moraes.—On Wednesday afternoon, May 13th, Messrs. Craig, Taylor & Co., launched from their Thornaby shipbuilding yard, Thornaby-on-Tees, a very handsome twin-screw passenger steamer for the Brazilian trade. The dimensions are—230 ft. by 33 ft. by 20 ft. depth, moulded. The vessel has a promenade deck extending the whole length of the ship, fitted with awnings, deck seats, &c. The first-class saloon, which is in the after part of the vessel, is beautifully fitted up in hardwood, suitably upholstered; ornamental and stained glass skylights, and jalousies are fitted suitable for the hot climate, piano also being supplied. Sleeping accommodation for over 50 first-class passengers is fitted up alongside the saloon. At the fore end of the vessel there is sleeping accommodation for 60 second-class passengers. The vessel is fitted throughout with electric light on the double wire principle. In addition to carrying passengers, she is arranged so as to be able to carry cargo, and is equipped with two steam winches, steam windlass, steam steering gear, large donkey boiler, &c. The twin-screw engines are by the North Eastern Marine Engineering Co., Limited, Sunderland, and will give her a high rate of speed. Mr. John Donald, of Bahia, has superintended the construction of both the ship and engines. As she left the ways she was gracefully christened the *Prudente de Moraes* by Mrs. John Donald, the wife of the superintendent. This is the second vessel that Messrs. Craig, Taylor & Co. have built for these same owners.

Steel Towing Vessel.—On Wednesday, May 13th, there was launched from the dockyard of Sir Raylton Dixon & Co., at Middlesbrough, the first of some steel towing vessels built to the order of the American Petroleum Co., of Rotterdam, for the Scheepvaart En Steenkolen Maatschappij. These vessels are 170 ft. in length with a beam of 32 ft., and depth of 13 ft 7 in., having a deadweight cargo capacity of 1,000 tons, and built under Lloyd's special survey 100 A1. These vessels are intended for a new departure in the coal carrying trade across the North Sea. The screw collier, carrying herself 1,700 tons of coal, will tow one of these crafts with 1,000 tons between the coal ports of the North of England and Rotterdam, and for this purpose they are specially constructed with water ballast and fitted with sails and very heavy chains and anchors, so as to be quite independent and seaworthy should the steamer have to cast them adrift at any time through stress of weather. The other vessels for the completion of this scheme are also being built by Sir Raylton Dixon & Co.

Juanita North.— On May 14th Messrs. Short Brothers launched at Sunderland the new steamer *Juanita North*, built for the Nitrate Producer's Steamship Co., Limited, managed by Messrs. Lawther, Latta & Co., London. This is the third steamer built by Messrs. Short Brothers for this company during the last twelve months. The *Juanita North* is:—In length, 352 ft.; breadth, 45 ft.; depth, moulded, 27 ft. 9 in.; cargo capacity, 5,400 tons. The engines are by Messrs. George Clark, Limited, of 300 H.P., with boilers of 180 lbs. working pressure, with Howden's forced draught fitted.

Oilfield.—On May 14th there was launched from the yard of the Tyne Iron Shipbuilding Co., Limited, Willington Quay-on-Tyne, a large steamer to carry oil in bulk, which has been built to the order of Messrs. Hunting & Son, of Newcastle-on-Tyne. The vessel is of the following dimensions:—Length, 356 ft.; breadth, 47 ft.; depth, 30 ft. 3 in.; to class 100 A1 at Lloyd's on the spar deck principle for carrying petroleum in bulk, and is to have engines with cylinders 27 in. 44 in. and 71 in. by 48 in. stroke. These will be supplied by the Wallsend Slipway and Engineering Co., Limited, of Wallsend-on-Tyne. Her outfit includes the very latest developments and appliances for the trade that she is intended to be engaged in. The subdivision of the tanks are in accordance with the requirements for carrying oil in bulk through the Suez Canal. On leaving the ways the vessel was named the *Oilfield* by Miss Arthur, of Glenariff, London.

Steel Coal Barges.—There were launched on May 14th, at the yard of Messrs. Sir Raylton Dixon & Co., two steel coal barges, built to the order of the Steam Coal Co., Rotterdam. These barges have been specially designed by Messrs. Flannery & Tritton, of Liverpool and London, for the transit of coal at sea, the intention being to tow them by steam tugs or by collier steamers. The system of towage by steamers for long distances at sea as an economical means of cargo transit is much in use in America, and is believed to compare favourably with the cost of conveyance in the ordinary way. The barges are each 170 ft. long, with a breadth of 32 ft. 6 in. and 13 ft. 7 in. depth, and the design includes forecastle and poop decks raised 3 ft. above the main deck, and running fore and aft between these two decks are continuous hatch coamings to the same height, the barge being closed in with bulwarks 3 ft. 6 in. high. The vessel is divided by a collision bulkhead at each end, forming peak water ballast tanks, and with two further watertight bulkheads forming a water ballast tank amidships, the latter compartment being further divided longitudinally. Each vessel is provided with two steam winches and a donkey boiler, together with hand steering gear and windlass, and the two masts are arranged to be lowered. The rudder is so arranged that a special movable portion may be added, and the rudder so lowered below the keel line when at sea. The decks are of steel, and the centre ballast compartment, continued up to the top of the hatch coaming, is also covered with a steel deck, together with a short length of the hatch top at the fore end of each hold, and on these steel covered portions are fitted the masts and winches. The portion over the centre tank is provided with two watertight hatchways for the access of cargo. Each barge has accommodation for a crew of six hands.

Trojan Prince.—On Thursday, May 14th, there was launched from the shipyard of Messrs. John Readhead & Sons, South Shields, a large handsomely-modelled steamer of about 5,000 tons capacity, which has been built for the Prince Line of steamers, of Newcastle-on-Tyne, and is the third vessel built and engined by Messrs. Readhead for this fleet of steamers. The directors of the Prince Line have given the composition of their fleet very careful consideration, and in common with the policy adopted by most large steamship companies, during the past year have disposed of several of the old and small steamers which have become obsolete and quite unable to compete with the greatly improved and larger vessels that, during the past few years, have been put into nearly all trades, and they are now steadily replacing them with steamers of the most modern type, of greatly augmented speed, and specially designed to meet the particular requirements of the various services worked by the vessels of the line. In pursuance of this policy, the *Trojan Prince* has been built more particularly for the River Plate trade, and will, no doubt, greatly enhance the reputation of the service. She is a somewhat similar vessel to the well-known *Tartar Prince*, which steamer at present holds the record passage to Argentina of 21 days 1 hour, and has earned for herself a very high reputation among passengers for her great steadiness at sea. The *Trojan Prince* is somewhat longer, has finer lines, and more powerful machinery, and is expected to attain a speed of thirteen knots fully laden, and make the passage from this country to Argentina—calling at Madeira and Teneriffe with passengers—under twenty days. Very superior passenger accommodation is provided under the bridge deck, with a large airy saloon and music-room above, and there is a comfortable smoking saloon on the after-part of the bridge deck. Particular attention has also been paid to the ventilation of the saloon and state-rooms, and electric fans have been fitted. The ship will be lighted throughout by electricity. The vessel is built to the highest class of Lloyd's Register, and has been specially strongly constructed. The 'tween decks are very high and available for emigrants, and she has also a large poop suitable for second-class passengers. Special attention has also been paid to the machinery and gear for the expeditious handling of mixed cargoes and heavy weights, and all the deck and other fittings are of the most recent and improved type. The *Trojan Prince* is expected to leave London in July for Argentina, landing passengers at Madeira and Teneriffe on her way down. She will be under the command of Captain John Hesketh, late of the s.s. *Tartar Prince*. The propelling machinery has been built under the inspection of Mr. John Trail, and the ship has been constructed under the supervision of Mr. M. C. James. As the vessel left the ways she was named by Miss Scott, daughter of Mr. C. H. Scott, of West Bank, Heaton Mersey, Manchester, chairman of the Prince Line.

Carham.—On Thursday, May 14th, Messrs. Furness, Withy & Co. launched from their yard, at Hartlepool, a large steel screw steamer, built to the order of Messrs. The Thompson Steam Shipping Co., Sunderland. She is a fine type of a modern cargo boat, measuring over 320 ft. in length, and built throughout of Siemens-Martin steel, with a large measurement and deadweight capacity, and built to the highest class at British Corporation. The vessel is of the single deck type with poop, bridge, and topgallant forecastle. The holds are fitted with iron grain divisions, and all decks, deck erections, skylights, bulwarks, bulkheads, &c., are constructed of steel and iron. Cellular bottom fitted all fore and aft for water ballast. The greater portion of the plates are in 24 ft. lengths, making the structure of the ship very strong. Four steam winches, donkey boiler, patent steam steering gear amidships, screw gear aft, direct steam patent windlass, stockless anchors hauling into hawse pipes, and other modern appliances are fitted for the handy working of the vessel. The saloon and cabin, providing accommodation for the captain, &c., are handsomely finished in polished hardwood with painted panels. The steamer will be rigged as a two-masted fore-and-aft schooner, and has been constructed under the supervision of Mr. C. Potts, on behalf of the owners. She will be fitted with triple-expansion engines by Messrs. W. Allan & Co., Sunderland, of massive design, with every provision for the economical working of the vessel. On leaving the ways she was named *Carham*, by Miss Potts, of Sunderland.

Ashby.—On May 14th Messrs. Ropner & Son, of Stockton, launched a steel screw steamer of the following dimensions, viz.:—Length, between perpendiculars, 270 ft.; breadth, 39 ft. 6 in.; moulded depth, 17 ft. 6 in.; which they have built for a West Hartlepool firm. The steamer is built off the part awning decked rule, having poop and raised quarterdeck, her deadweight carrying capacity being 2,600 tons on 16½ ft. The saloon and cabins for the captain and officers are fitted in the poop, whilst the engineers are accommodated in iron houses placed on the awning deck near the entrance to engine-room. She is built on the web frame principle, leaving the holds entirely clear for cargo, and carries her water ballast in a cellular bottom and in the after peak; all labour-saving appliances are fitted for the economical working of the steamer, and also for the expeditious loading and unloading of cargoes. She has steam steering gear amidships and screw gear aft; four powerful steam winches, two large donkey boilers working at the same pressure as the main boilers, patent windlass, stockless anchors, &c. The engines will work up to about 700 effective H.P., and are by Messrs. Blair & Co., having cylinders 19½ in., 32½ in., and 52½ in. by 36-in. stroke, steam being supplied by two large steel boilers working at 160 lb. pressure. The steamer was named *Ashby* by Mrs. J. W. Ropner, of West Hartlepool.

Steel Screw Steamer.—On May 16th Messrs. R. Craggs & Sons launched at Middlesbrough a steamer of the following dimensions:—Length 155 ft. 6 in.; breadth, 22 ft.; depth, 10 ft. moulded. The engines have cylinders of 14 in. and 31 in. by 21 in. stroke. She has been specially built for trading on the river Amazon, and is fitted to carry 25 first-class passengers.

Alert.—On May 16th Messrs. Cook, Welton & Gemmell launched at Hull a steam trawler, to the order of Messrs. Wilkin & Barratt, fish merchants, &c., Milford Haven. The vessel was named the *Alert*, and she will be engined by Messrs. C. D. Holmes & Co.

Teniente Serrano.—On May 16th Messrs. Laird Brothers, of Birkenhead, launched the *Teniente Serrano*, the third of four 30-knot torpedo-boat destroyers building for the Chilian Government. The naming ceremony was performed by Senora Aguirré, wife of Captain Aguirre, of the Chilian Navy. This is the seventh 30-knot destroyer launched during the last eight months by Messrs. Laird.

Claverhill.—On Friday, May 22nd, there was launched from the shipbuilding yard of Messrs. C. S. Swan & Hunter, Limited, a steel screw steamer, which is being built for Messrs. Edmund Haslehust & Co., of Billiter House, London. This steamer has been specially designed by Messrs. Jacobs & Barringer, London, for carrying a large cargo on a moderate draught, is built to the spar deck rule, and is 310 ft. between perpendiculars by 42 ft. beam by 27½ ft. deep, and will carry about 4,600 tons deadweight. She is furnished with a long full poop, long bridge, and topgallant forecastle, the accommodation for the captain, officers, and engineers being amidships. The steamer has six steam winches, large multitubular donkey boiler, and large hatches, all with complete equipment of gear for rapidly loading and discharging cargo. She is also fitted with a cellular double bottom throughout, and a trimming tank so as to enable her to steam from port to port without cargo. The machinery has been constructed by the North-Eastern Marine Engineering Co., Limited, of Wallsend, and consists of a set of cylinders 23 in., 38 in., and 61 in. diameter, by 39 in. stroke, with two large boilers 14 ft. 9 in. by 10 ft., with all the most modern improvements for economical steaming. During the construction of the vessel, which on leaving the ways was gracefully christened the *Claverhill*, by Miss Wigley, daughter of the captain, she has been superintended by Mr. Barringer (who was present at the launch to represent the owners), assisted by Mr. Bradney. On completion the *Claverhill* will be commanded by Captain Lewis Wigley.

LAUNCHES.—Scotch.

Ogun.—On April 9th a steel schooner-rigged steamer, of 360 tons gross, named the *Ogun*, was launched at Dundee, owned by G. L. Gaiser, Hamburg.

Helen.—At the beginning of last month the *Helen*, a little schooner for Mr. Fred Lobnitz, of Renfrew, was launched from Fife's yard at Fairlie. She is a very pretty little vessel of about 20-rating, and is meant for cruising purposes.

Amapu.—Messrs. Russell & Co. have lately launched on the Clyde the steel screw steamer *Amapu*, for the Amazon Steam Navigation Co., Limited, to be employed in their passenger service on the river Amazon. The dimensions are:—Length, 150 ft.; breadth, 25 ft.; depth, 10 ft. 6 in., moulded. Messrs. Kincaid & Co., Greenock, will supply engines with cylinders of 13 in., 20 in., and 32 in. by 24 in. stroke.

Heather Bell.—On April 16th a steel schooner-rigged steamer, of 1,252 tons gross, named the *Heather Bell*, was launched at Campbeltown, owned by the Heather Bell Steamship Co., London.

Barcellos.—On April 28th Messrs. A. Rodger & Co. launched at Port-Glasgow the steel twin screw steamer *Barcellos*, to the order of the Amazon Steam Navigation Co., Limited, London. This steamer is a duplicate of the *Sapucaia*, launched by the same firm about a fortnight ago, and is intended for cargo traffic on the river Amazon. Two sets of triple-expansion engines will be supplied by Messrs. Hall-Brown, Buttery & Co., Glasgow.

Industry.—On April 28th Messrs. Lobnitz & Co., Limited, launched from their yard the twin-screw hopper barge *Industry*, which has been built for the Government of Ceylon to the order of Messrs. Coode, Son & Matthews, engineers, London. The vessel, which has been specially constructed to be used either as a barge or tugboat, is fitted with triple-expansion engines of the most modern type. Her length is 105 ft. 6 in.; beam, 20 ft.; and depth, 9 ft. She has been built under the superintendence of Mr. Robert Anderson, local inspector, and will proceed to Colombo, to be used in the harbour improvements there.

Kellie Castle.—On April 28th there was launched from the yard of Messrs. Hawthorns & Co., Limited, the first of three vessels which they are at present constructing for steam fishing companies in Anstruther. The vessel launched yesterday is to the order of the Castle Steam Fishing Co., Limited, Anstruther, and her dimensions are as follows:—Length between perpendiculars, 90 ft.; breadth, moulded, 19 ft.; depth, moulded, 10 ft. 6 in. She will be supplied by her builders with compound surface-condensing engines, working at a pressure of 120 lbs., and fitted with the most improved appliances for line fishing. As she left the ways she was christened *Kellie Castle* by Miss Gardner, Anstruther.

Glaucus.—On April 28th Messrs. Scott & Co. launched at Greenock the large steel screw steamer *Glaucus*, for the Ocean Steamship Co., of Liverpool. The dimensions of the new vessel are as follow:—Length, 422 ft.; breadth, 49 ft.; and depth, 31 ft. 6 in.; of 5,200 tons gross, and a carrying capacity of 7,200 tons. She will be supplied by the builders with triple-expansion engines of 3,500 I.H.P., the diameter of cylinders being 29 in., 50 in., and 82 in. respectively, with a piston stroke of 5 ft. The ceremony of naming the steamer *Glaucus* was performed by Mrs. Alfred Holt, of Liverpool.

London City.—On Tuesday, April 28th, Messrs. Alex. Stephen & Sons launched at Linthouse, for Sir Christopher Furness, of West Hartlepool and London, a large cargo and cattle steamer, which was named the *London City* by Lady Furness. This vessel is a duplicate of the one pretty fully described at the time, which was launched at Linthouse in February for the same owner, and was then named the *London City*, but was subsequently purchased by Messrs. Wilson, of Hull, and renamed the *Idano*. The dimensions are:—465 ft. by 49 ft. by 34½ ft., with shelter deck above. The measurement carrying capacity is about 10,000 tons; there is accommodation under shelter deck for 700 cattle, and in upper bridge for 100 cattle or horses, of which the Furness Line carry a large number. The arrangements and fittings for cattle are the very best that have yet been devised. The engines (also built by Messrs. Stephen) have cylinders 32 in., 54 in., and 86 in. diameter, by 54 in. stroke, and a working pressure of 180 lbs. The *London City* will be a fast steamer, and is splendidly furnished and equipped in every way for the service of the popular Furness line, in carrying horses, cattle, and cargo. She is the 11th steamer of Messrs. Stephens's construction acquired by this line.

Neptune.—On April 29th there was launched from the shipbuilding yard of Messrs. Barclay, Curle & Co., Limited, Clydeholm, Whiteinch, a powerful steel twin-screw steam tug, built to the order of the Southampton, Isle of Wight and South of England Royal Mail Steam Packet Co., Limited. The vessel is classed 100 A1 at Lloyd's, and is intended for general towing purposes, and when required, to act as tender to American liners in Southampton waters. She is also adapted to ply as an excursion steamer, and to this intent is provided with the necessary Board of Trade certificate for passengers, who will be accommodated in a well-appointed cabin and deck shelters. The vessel is fitted with powerful steam steering gear, steam windlass, &c., and furnished with every requisite necessary for efficient towing, and for the carriage of luggage and the comfort of passengers. The builders have constructed several saloon paddle-steamers for same owners, the present vessel being the fourth tug steamer of the same type built for them. The dimensions are—135 ft. by 25 ft. by 12 ft. 7 in. On leaving the ways Mrs. Archibald Gilchrist, junr., Milton, Bearsden, named the vessel the *Neptune*. After the launch the vessel proceeded to the harbour to take on board her machinery, which is being supplied by the firm. The engines are two sets of compound inverted direct acting, with two large single-ended boilers, which will indicate 1,200 H.P.

Maria.—On April 30th the steam yacht *Maria* was launched from the yard of Messrs. Napier, Shanks & Bell, Yoker, which has been built to the order of Mr. Ninian B. Stewart, of Torquay and Wemyss Bay, from designs by Messrs. G. L. Watson & Co., Glasgow. The *Maria* has been built to replace the former *Maria* (now *Rhouma*), sold by Mr. Stewart to Mr. Bullough, of Accrington. The dimensions of the new vessel are:—Length, 228 ft.; breadth, 27 ft. 8 in.; depth, 19 ft. 3 in.; and about 860 tons Y.M. The internal arrangements of saloons and cabins are similar to the *Rhouma*, and to her predecessor, the *May*. She is schooner-rigged, with fore-and-aft sails, and flying square sail on fore mast. Two large houses are constructed on deck, framed and plated in steel and panelled in polished teak, and fitted up internally in light oak, French-polished, equal to main saloons. Each of the deck-houses form a companionway to the respective ends of the vessel; while on the starboard side, in 'tween decks, is a passage-way between the dining and drawing-room, thus avoiding the necessity of having to go on deck in bad weather. The dining saloon, which is situated forward of the engine space, is a large, airy compartment extending the width of the vessel, and is fitted and furnished in oak, French-polished. At the fore end of this saloon, on each side of the passage, is the owner's suite of rooms, each of which is framed in light oak and panelled in bird's-eye maple, the furniture being in walnut. The drawing-room, placed at the after end of engine space, is similar in size and arrangements to the dining saloon, but the walls are in polished walnut. Abaft of the drawing-room are state-rooms for guests, fitted and furnished similar to the owner's room. The captain and officers are berthed forward of the owner's quarters in rooms branching off a well-apportioned mess-room, suitably framed and panelled in pine, while the crew are housed in a large-sized forecastle. The plumber work and sanitary arrangements are of the most complete description, comprising Downton pump, patent lavatories, enamelled copper baths, hot and cold water service pipes, &c. The upholstery likewise will be very handsome, and should present a fine appearance when finished. The vessel throughout will be fitted with a complete installation of electric light, and, in addition, supplementary lamps will be supplied to all the rooms. A handsome tiled fireplace is placed in each saloon, and electric bells are fitted throughout the yacht. The deck gear consists of steam windlass, steam steering gear (to steer from bridge and aft), and steam warping capstan aft; while the davits will carry four boats and two steam launches. Awnings will be provided right fore and aft and over bridge. The machinery is being supplied by Messrs. D. Rowan & Sons, and is of power to maintain a high rate of speed. The hull and machinery has been constructed to Lloyd's 100 A1 class. The vessel was named by Mrs. N. B. Stewart, jun., and amongst those present were Mr. N. B. Stewart, jun.; Mr. and Mrs. J. B. Stewart, Mr. R. B. Stewart, Miss Stewart, Miss Edith Stewart, Mr., Mrs. and the Misses Sharp; Captain Periam, Captain Pond, Captain Trayler, Mr. J. R. Thomson, Mr. Barton van Voorhis, Mr. G. L. Watson, Mrs. Watson, Miss Lovibond, Mr. and Mrs. Coutts, of Auckland; Mr. M'Kay, Mr. Hughes, Mr. Lang, Mr.

Moore, Mrs. Scott, Miss Rae, Miss Hughes, Miss Gilchrist, Mr. Craig, Mr. and Mrs. Macindoe, Rev. W. A. Liston and Mrs. Liston.

Sir John Coode.—At Renfew, on April 30th, there was launched complete, from the works of Messrs. Wm. Simons & Co., Limited, a large and powerful twin-screw hopper-dredger, constructed to the order of the Crown Agents for the Colonies for the Government of Ceylon. It is for service at Colombo Harbour Works, and was built under the direction of Messrs. Coode, Son & Matthews, consulting engineers, Westminster, Mr. Wilson Wingate, N.A., being inspecting engineer. Its dimensions are as follows:—Length, 216 ft.; breadth, 40 ft.; depth, 15 ft. The hopper compartments are provided on each side of well, and have a joint capacity for 900 tons dredgings, having all the necessary gear for lifting and lowering the hopper doors by steam and hand. The vessel is also adapted for loading barges of large capacity on either side when required, in addition to filling its own hopper, the upper tumbler being high enough to allow sufficient angle for shoots to fill the barges when the dredger is fully loaded. The buckets have a capacity of 18 cubic feet each, and the bucket ladder works in a central well capable of dredging to a depth of at least 36 ft. under water level when the vessel is light, and the angle of the ladder does not exceed 45 degrees. The weight of the bucket ladder, with buckets and mountings complete, is about 170 tons. It is propelled by two sets of triple-expansion engines, driving twin-screws of 1,000 combined I.H.P., and has two boilers of mild steel, constructed for a working pressure of 160 lbs. per square in. An auxiliary boiler is also fitted in the stokehold to work the deck machinery when under repair. Powerful triple-barrelled steam mooring winches are provided at bow and stern, each barrel working independently or conjointly as required. Steam hoisting engines are provided for lifting the bucket ladder and also for raising the hopper doors, two independent sets of steam-steering gear. Double-geared anchor cranes of special construction are fitted at bow and stern. Awnings are fitted on deck fore-and-aft. The cabins for officers and crew are comfortably fitted up with separate rooms for the officers, and bath-rooms attached. The timber fittings throughout the vessel are of teak. On leaving the ways she was gracefully named the *Sir John Coode* by Mrs. Coode, wife of the senior partner of Messrs. Coode, Son & Matthews, whose father, the late Sir John Coode, was the founder of that well-known firm of civil engineers.

Sussex.—On April 30th Messrs. William Denny & Brothers, Dumbarton, launched the twin-screw steamer *Sussex*, built by them for the London, Brighton and South Coast Railway Co. and the Western Railway of France Co., and intended to run between Newhaven and Dieppe, to replace the *Seaford*, lost last year, and which was also built by Messrs. Denny. The *Sussex* is virtually a repeat of the *Seaford*; certain small improvements have been introduced, but the companies were so satisfied with the *Seaford* that these alterations are in detail only. Her length over all is 275 ft. by 34 ft. by 14 ft. to the main deck. Above this there is almost a complete promenade deck extending from the bow and reaching very nearly to the stern. Her passenger arrangements are generally similar to the *Seaford*, but an additional bulkhead has been fitted aft, thus further subdividing the vessel and increasing her safety in the event of collision. The accommodation consists of separate first-class gentlemen and ladies' saloons underneath the main deck forward; aft, one second-class ladies' saloon and two second-class gentlemen's saloons. On the main deck forward there is space reserved for third-class passengers. Immediately abaft this, and separate from the third-class by a steel bulkhead, comes a first-class dining saloon, and from this enclosed space entrance is also gained to the lower saloons. Sleeping accommodation such as usually is found on board of first-class Channel steamers is fitted throughout, so arranged that the vessel can either be used for the day service or the night service, and similar arrangements exist aft. On the after-deck the entrance to the second-class saloon is protected by deck-houses containing second-class smoking-room, lavatories, &c. On the promenade deck there are special state-rooms for the first-class (six in number), as also a handsomely-appointed smoking-room and vestibule giving entrance from this deck to the first-class dining saloon. Above the deck-house containing these special rooms there is the flying bridge and the boat deck. The vessel will be measured for 750 passengers, and is supplied with all the usual equipment of life-saving appliances to the Board of Trade rules, but more reliance is naturally placed upon the minute subdivision of bulkhead which has been carried out in this steamer. The machinery, which is supplied by Messrs. Denny & Co., and is identical with that supplied to the *Seaford*, and which proved so very efficient in service, consists of two triple-expansion, four cylinder, four crank engines, supplied with steam by four single-ended boilers fitted in one boiler compartment, and having only one stoke-hold. This arrangement naturally leads to great efficiency and economy in the stoking department. The vessel is fitted with forced draught on the closed stoke hold principle, and is intended, like the *Seaford*, to develop a speed of not less than 20 knots per hour on the passage. The plans of the steamer were to the approval of the joint owners, the two railway companies, and have been carried out by the builders under the direction of their representatives—Mr. Billington, principal surveyor; Mr. Fisher, inspector; Captain Lambert, marine superintendent; Mr. Funnel and Mr. Moneypenny as resident surveyors. The launching ceremony was performed by Viscountess Duncannon, and after a most successful launch the company adjourned to the builders' model-room, where lunch was served. The names of those present were as follows:—Lord and Lady Duncannon, and, as representing the Brighton Co., Mr. Billington, Mr. Gerard, Captain Lambert, Mr. Fisher, Mr. Funnel, and Mr. Moneypenny; as representing the Western Railway of France Co., Monsieurs Henry Blount, Edward Blount, Visinct, Delaitre, Blanche, and Larere. There were also present—Mr. Walter Brock, senior partner of the firm, and Miss Brock; Mr. and Mrs. Peter Denny, Mr. and Mrs. Arch. Denny, Miss Whealler, Mr. Leslie Denny, Mr. R. B. Pope, Mr. and Mrs. Ward, Mr. H. W. Brock, Mr. and Miss Wedgwood, Mr. John Darling, Union Steamship Co. of New Zealand; Miss Rodie and Miss Craig, Dumbarton; Mr. Webb, L. and N. W. Railway, Crewe; Mr. Stark, Mr. Peter Barr, &c.

Mantinac.—On April 30th Messrs. Russell & Co. launched at Port-Glasgow a steel screw steamer of 2,720 tons register, capable of carrying 4,300 tons deadweight, to the order of Messrs. William Thomson & Co., New Brunswick. The dimensions are:—Length, 310 ft.; breadth, 42 ft. 6 in.; depth, 25 ft. 6 in. Triple-expansion engines will be supplied by Messrs. Kincaid & Co., Greenock. The vessel was named *Mantinac*.

Steam Hopper Barge.—On May 1st Messrs. Wm. Simons & Co., Limited, Renfrew, launched from their yard the last of the three steam hopper barges, recently ordered by the Admiralty. It is of the following dimensions:—Length, 160 ft.; breadth, 28 ft. 6 in.; depth, 12 ft. 6 in.; and has a hopper capacity for 570 tons of dredgings. This vessel was launched with all her machinery on board complete, with steam up, and will in a few days leave for H.M. Dockyard, Devonport, where she is to be employed. Messrs. Hay, Stewart, and Scoggins, Admiralty overseers, represented the Admiralty at the launch.

Prince Arthur.—On May 9th Messrs. William Denny & Brothers, Dumbarton, launched the twin-screw steamer *Prince Arthur*, built by them for the London, Brighton, and South Coast Railway Co., and intended to run between Newhaven and Caen with the *Calvados* and *Trouville*, which were also built by Messrs. Denny. The *Prince Arthur* is virtually a repeat of those vessels, except that the passenger accommodation has been increased to meet the increasing requirements of the service. Her dimensions are 195 ft. by 28 ft. by 15 ft. to the main deck. Above this there is a long bridge containing the first-class accommodation, and a forecastle with turtle back containing third-class accommodation. On the bridge deck, which is 78 ft. long, thus affording a splendid promenade for first-class passengers, there is a companion from which passengers can reach a vestibule opening into the dining saloon and ladies' saloon on the starboard side of a fore and aft passage. On the port side this passage extends right through the bridge, and gives access to the first-class state-rooms, captain's and chief engineers' rooms, lavatories, &c., which are situated in the side houses. There is also a door from it into the dining saloon, which extends to the ship's side to starboard. The wheelhouse is on the bridge deck before the funnel, and above it is the flying bridge, extending from side to side of the ship. There are cargo holds before and abaft the machinery space, which are worked by winches and derricks on fore and main masts. The fore hold has an exceptionally large hatch; the fore and aft peaks are fitted as trimming tanks. The machinery, which is supplied by Messrs. Denny & Co., is identical with that supplied to the *Calvados* and *Trouville*, and which proved so efficient in service, consists of two triple-expansion engines supplied with steam by one single-ended boiler. The vessel is intended to develop a mean speed (like the *Calvados* and *Trouville*) of not less than 15 knots per hour on two runs between the Cloch and Cumbrae Lights. The plans of the steamer were to the approval of the owners, the railway company, and have been carried out by the builders under the direction of their representatives—Mr. Billinton, principal surveyor; Mr. Fisher, inspector for the fleet; Captain Lambert, marine superintendent; and Mr. Funnel as resident inspector. The christening ceremony was performed by Lady Henry Nevill, who was also accompanied by Lord Henry Nevill, Sussex; Lord Reginald Stewart, the Hon. Leonie Guest, Mr. Bickerstieth, a director of the company; Mr. and Mrs. Peter Denny, Colonel Archibald Denny, Miss Roddie, Helenslee; Mr. John Ward, Mr. Gerard, Continental traffic manager; and Professor M'Kendrick, Glasgow University.

Kia Ora.—On May 11th Messrs. Robert Duncan & Co., Limited, launched from their shipbuilding yard at Port-Glasgow a steel twin screw steamer for passenger service in New Zealand. This vessel has been built to the order of Mr. H. A. M'Gregor, of Auckland, New Zealand, and will be fitted with two sets of triple-expansion engines by Messrs. Muir & Houston, Limited, of Glasgow, combining all the latest improvements. The propellers are of Stone's patent metal, and are of a very fine pitch to ensure a speed of not less than 11½ knots. A complete electric installation by Messrs. H. & J. Robinson, of Liverpool, is fitted, having a powerful search-light on the bridge for navigating the narrow channels and rivers in the night-time. A patent windlass by Emerson Walker, and two steam winches by Mr. David Gordon, are supplied. The steamer has commodious saloons, ladies' cabins, state-rooms, and smoking-room, all of which will be fitted up in a most luxurious manner. After the trial trip, and for the purpose of sailing out to her destination, the vessel will be rigged with three masts and large sails, and docked to have false keel fitted and propellers and tail-shafts withdrawn. The steamer has been built to the highest class in the British Corporation of Shipping, and to the requirements of the Board of Trade for passenger certificate. On leaving the ways the vessel was named *Kia Ora* by Miss Jessie Macrae, of Wishaw.

Lady Wentworth.—On May 12th Messrs. Scott & Co., shipbuilders, Greenock, launched a large four-masted barque, in presence of a large concourse of ladies and gentlemen. The vessel has been built to the order of Messrs. Adam, Hamilton & Co., shipowners, Greenock, and is intended for a general cargo trade. Her dimensions are as follows:—Length over all, 296 ft.; breadth, 45 ft. 6 in.; depth, 27 ft. 6 in. She is of 2,655 tons gross and has a deadweight capacity of 4,200 tons. On leaving the ways she was christened *Lady Wentworth*, Mrs. Archibald Adam, wife of one of the owners, performing the ceremony.

Meteor.—On May 13th the racing cutter *Meteor*, which Messrs. D. & W. Henderson, Meadowside, have built for H.I.M. the Emperor of Germany, was launched. The tide was only about the average for the season, but the transference from land to water, though comparatively a tedious affair, was more easily accomplished than the floating of most boats of the type. For a time it looked as if there would be a wait until another tide, and even when Lady Lonsdale performed the christening, and wished "Success to the *Meteor*," it was doubtful if there was sufficient water. At the end of the slip there was a halt for several minutes, but about 25 minutes to two o'clock the vessel floated, amidst the cheers of the crew and of the workmen on both banks of the Kelvin. Admiral R. Von Eisendecher represented the Emperor at the launch, and amongst the other ladies and gentlemen present were Lord Lonsdale, Lady Lonsdale, Captain Gulich, Mr. Vanroorhis, Mr. John Henderson, Mrs. John Henderson, Mrs. Watson, Mr. G. L. Watson, Mr. Brooks, and Mr. J. B. Hilyard.

Serpolette.—On May 14th Messrs. John Reid & Co., Limited, launched on the Clyde the auxiliary screw steam yacht *Serpolette*, which they have just built to the order of Mr. Baring, Gruinard, Aultbea. This little vessel is rigged as a yawl and fitted with Bevis patent feathering propeller, and is intended for cruising in the West Highlands.

Britannia.—On May 14th Messrs. S. M'Knight & Co. launched from their yard at Ayr, a handsome saloon paddle steamer, built to the order of Messrs. P. & A. Campbell, Limited, for their passenger service in the Bristol Channel. This is the fourth steamer S. M'Knight & Co. have built for Messrs. Campbell. The dimensions of the new steamer are:—Length between perpendiculars, 230 ft.; breadth, 26 ft. 6 in.; depth, 9 ft. 9 in., moulded. The hull and machinery have been constructed under Board of Trade special survey. She has deck saloons, with promenade deck over same extending full length of vessel; a house on top having rooms for pilot and ticket clerk, with a pilot bridge over this house from which the vessel is steered; a raised quarterdeck aft of 20 ft., with a steam capstan thereon for warping purposes. The after-deck saloon is handsomely fitted up in polished hardwood, with gilt cornices, having large plate glass windows all round, artistic Lincrusta ceiling, tinted and relieved with gold mouldings; sofas all round, and cross-seats upholstered in Utrecht velvet; Brussels carpets and runners on floor, and windows neatly draped with damask curtains. At the fore end of this saloon on port side, are ladies' cabins and lavatories, and captain's on the starboard side, finished similar to deck saloon. The dining saloon is under main-deck aft, about 60 ft. in length, fitted in oak with maple panels, with tables and seats to accommodate 200 passengers. At the fore end of this cabin there is a large bar and pantry, which are replete with every convenience. There is a commodious refreshment saloon under main deck forward, having bar-room with circular front. The floor of this saloon, as well as the dining saloon floor, is neatly laid with mahogany and oak polished. The machinery will be supplied by Messrs. Hutson & Son, Glasgow—viz., one pair compound surface-condensing diagonal engines, cylinders 37 in. and 67 in. diameter by 66 in. stroke, one haystack boiler 16 ft. 11 in. diameter by 15 ft. 6 in. high, of improved design, 110 lbs. W.P. A complete installation of electric lighting will be fitted by Claude Hamilton, Limited, Glasgow. The vessel has a direct steam windlass and capstan combined of Messrs. Napier Brothers' make, a steam warping capstan by Fisher & Co., Paisley, and Caldwell & Co.'s, Limited, steam steering gear. The vessel was named *Britannia* by Miss Allison, of Clifton, Bristol.

N. J. Fjord.—On Thursday, May 14th, Messrs. Lobnitz & Co., Limited, launched from their yard at Renfrew a powerful screw steamer for the United Steamship Co. of Copenhagen. The vessel is built under special survey of Bureau Veritas, and has large accommodation for first-class passengers and emigrants. The owners were represented by Mr. L. C. Caspersen, superintendent engineer, under whose supervision the vessel has been built, assisted by Captain Thomsen and Mr. Fricke. On leaving the ways she was named *N. J. Fjord* by Mrs. Morris, of Ramsey Lodge, Trinity.

Restauracion.—On May 15th Messrs. Napier, Shanks & Bell, Yoker, launched the twin-screw gunboat *Restauracion*, which has been built by them to the order of Messrs. Frame, Alston & Co., London, for the Government of San Domingo, under President Hereaux. The vessel, which has very fine lines, ram bow, and gunboat stern, is the second constructed by the same builders for the Republic: but the new vessel differs from her predecessor, the *Independencia*, in being larger in size and with greater speed, and otherwise better adapted for war purposes, having barbettes fitted on the sides mounted with Hotchkiss quick-firing guns, similar guns being also mounted at the bow and stern. The *Restauracion* is 214 ft. over all by 30 ft. beam. Commodious and handsomely-fitted rooms are provided for the President and his suite, besides accommodation for officers and artillerymen. She is fitted throughout with a complete installation of electric light, in addition to the usual supply of oil lamps. The deck gear, awnings, &c., are of the most complete description, and suited to the special service intended. The machinery is being fitted by Messrs. Dunsmuir & Jackson. It is of the most improved description, and will propel the vessel at a high rate of speed. Amongst those present at the launch were Mr. and Mrs. Frame, of London; Mr. H. R. A. Grieser, special commissioner to Great Britain from San Domingo and representative there of Messrs. Frame, Alston & Co.; Captain Celestino Andes, and Mr. George Froth, of the Dominican gunboat *El Presidente*; Mr. George M'Farlane (superintendent over construction of hull and engines), Mr. Alexander Baird, Principal and Mrs. Grant Ogilvie, Mr. Alexander Ogilvie, Mr. Arthur Turnbull, Mr. Stephen Ewen, Mr. A. E. M'Donald, Mr. William Taylor, Consul for San Domingo; Mr. and Mrs. Carfrae Alston, Mr. and Mrs. Walter Stewart, Mr. Coutts, Captain A. R. Brown, Japanese Consul, Glasgow; Captain Periam, Mr. Shoda, Mr. Chalmer, Mr. James

Wilson, Mr. Jackson, Mrs. Mollison, Miss Mollison, Mr. H. M. Napier, Mrs. Shanks, Miss Rutherford and Miss Scott, Miss Carswell, Misses Sloanes and Mitchell, Mr. Fraser, of Baird Trust; Mr. John Mellish, Mr. Gilmour, of San Domingo. The vessel was named by Miss Baird.

Isle of May.—On May 15th there was launched from the yard of Messrs. Hawthorn & Co., Limited, the second of three steam line fishing vessels which this company are at present building for Anstruther fishing companies. Her dimensions are 90 ft. by 19 ft. by 10 ft. 6 in. moulded, and the builders will supply her with engines to work at a pressure of 120 lbs. She is to be fitted out with the most approved appliances for a vessel of this kind. As she left the ways she was named the *Isle of May* by Miss Leslie, of Anstruther.

Start.—On May 16th Messrs. Scott & Sons launched from their shipbuilding yard at Bowling a screw steamer of dimensions 185 ft. by 29 ft. by 13 ft., built to the order of Mr. J. A. Larson, Skien, Norway. Triple-expansion engines will be fitted on board by Messrs. Ross & Duncan, Govan. On moving down the ways the steamer was named the *Start* by Mrs. James Scott, Stratholyde, Bowling.

Tutanekai.—Messrs. David J. Dunlop & Co., engineers and shipbuilders, Inch Works, Port-Glasgow, launched from their yard on Saturday, May 16th, a handsomely modelled steel twin-screw steamer of the following dimensions, viz.:—Length, between perpendiculars, 205 ft.; breadth, moulded, 30 ft.; depth, moulded, 15 ft. 9 in. The steamer has been built for the New Zealand Government, and is specially designed for cable laying and repairing purposes, two large circular cable tanks being fitted, one forward and one abaft of machinery space. The cable machinery and all fittings for paying out and lifting cables having been supplied by Messrs. Johnson & Phillips, Old Charlton, London. The builders are fitting two sets of triple-expansion engines to the vessel, having cylinders 15½ in., 25 in., and 40 in. diameter, with a stroke of 30 in., and two main boilers 13 ft. 1 in., diameter by 10 ft. 6 in. long, a large auxiliary boiler is also being supplied; the whole of the machinery has been designed for a working pressure of 170 lbs. The outfit of the steamer includes Napier's steam capstan, windlass and screw steering gear, Clarke, Chapman & Co.'s steam winches, Davis & Co.'s steam steering gear, and a complete installation of electric lighting and bells by Messrs. W. & J. Robinson, of Liverpool and London. Spacious state-room accommodation, dining-saloon, and apartments for navigating and cable officers, is provided amidships, whilst the petty officers' rooms and dining-saloon are fitted up aft under raised quarterdeck; the lighthouse keeper's quarters and crew's accommodation being placed in the forward part of the steamer. The construction of the vessel has been under the direct superintendence of W. H. Preece, Esq., C.B., W. R. Culley, Esq., having also taken an active interest in the general arrangements and the various details, his long experience in this class of work rendering his advice of great advantage. The steamer was gracefully named *Tutanekai* by Miss Taylor, daughter of the late Dr. John Wm. Taylor, Port-Glasgow, and amongst those present who met in the builders' private office were W. R. Culley, Esq., Professor Jamieson and Mrs. Jamieson, Mr. Braid, post master, Glasgow, and Mrs. Braid, Miss Baird, Miss Wylie, Miss Dunlop, Misses Jamieson, &c., &c.

LAUNCH—Irish.

Canada.—On May 14th the twin-screw steamer *Canada*, the latest addition to the Dominion Line, was launched by Messrs. Harland & Wolff, Belfast. The steamer is of large dimensions, and far exceeds anything yet trading between this country and Canada, having a tonnage of nearly 9,000, and being in many respects a *fac-simile* of the latest additions that Messrs. Harland & Wolff have built for the Atlantic trade between Liverpool and New York, such as the *Majestic*, *Teutonic*, &c. The *Canada* is designed to carry a large number of first and second class and also steerage passengers. The saloon is situated in a deck-house erected on the hurricane deck, with seating accommodation for nearly 200, and is surmounted by a very elaborate dome skylight in handsome stained glass, with decorated panels, having the crests of Montreal, Quebec, Toronto, and Liverpool, and also the arms of the Dominion of Canada. The majority of the state-rooms are also in the same house as the saloon, the baths and lavatories being arranged at the after end. On the deck below there is a handsomely-arranged second-class saloon, capable of seating about 100, and on this deck there is also a large number of first and second-class state-rooms, together with the officers' quarters, ice-house, lavatories, pantries, galleys, and other accommodation. The ship is also fitted with refrigerating machinery for carrying meat and provisions, and is lit throughout by electric light. The ship has two pole masts, and will be driven by twin triple-expansion engines of the latest description. She will be capable of crossing the Atlantic at any season of the year, without cargo, if necessary, having large water-ballast tanks fitted fore and aft. On the saloon deck, which has a very large and spacious promenade, easy seats have been arranged for the passengers, and on this deck is the captain's room, with handsome entrance to the saloon and library, handsomely decorated in polished woods, with bookcase, writing desks, &c. The steamer, besides being fitted with all the necessary appliances for the rapid loading and discharging of a large general cargo, can be fitted up, if necessary, for the conveyance of dead meat, and is also in every way suitable for transport service.

LAUNCH—Denmark.

Eronto.—On April 25th the s.s. *Eronto*, built to the order of Messrs. Hans Kiar & Co., of Drammen, Norway, was launched at the yard of the Elsinore Iron Ship Building & Engineering Co., Elsinore, Denmark. The steamer is built of steel to the highest class at Norwegian Veritas, and her dimensions are 238 ft. 9 in. by 34 ft 3 in. by 13 ft. 3 in. depth of hold. The engines are of the triple-expansion type, with surface condenser, indicating 600 H.P. In the vacant berth the keel of a freight steamer for Flensburg was laid down.

LAUNCH.—Norwegian.

Rio.—On Saturday, April 18th, there was launched from the yard of the Bergens Mekaniske Værksted, Bergen, Norway, a steel twin-screw steamer of the following dimensions:—Length, over all, 199 ft. 6 in.; breadth, moulded, 33 ft.; depth, moulded, 11 ft. 9 in. The ship is built to class 3 A1 Norwegian Veritas, and has poop aft, bridge amidship, and topgallant forecastle. Large peak tanks fore and aft, steam steering gear, steam windlass, three steam winches, ventilators to holds &c. Two sets of triple-compound engines, with cylinders 10 in., 15 in., and 25 in. in diameter, with 18 in. stroke. One boiler for 160 lbs. working pressure for both engines. In the engine and boiler-room is placed donkey boiler, feed and ballast donkeys, evaporator, and feed-water filter. The ship was named *Rio*, and is built to the order of Captain H. L. Lorentzen, Christiania. She is intended for trading on coasts and rivers in South America

TRIAL TRIPS.

Radley.—The *Radley*, a steel-screw steamer which was recently launched by Messrs. J. Priestman & Co., at Sunderland, left the Wear lately for her trial trip. This vessel, which has been built for Messrs. Galbraith, Pembroke & Co., of London, is 336 ft. long, 45·6 ft. broad, and 25·1 ft. moulded depth. The engines are of triple-expansion type, and have been constructed by Messrs. Blair & Co., Stockton-on-Tees, with cylinders 24 in., 40 in., and 56 in. by 45 in. stroke, with two large boilers of the single-ended type, designed for a working pressure of 160 lbs. per square inch. When the vessel was run over the measured mile she attained a speed of about 12½ knots.

Jattra.—The twin-screw steamer *Jattra*, built by Messrs. Robert Duncan & Co., Limited, and engined by Messrs. Rankine & Blackmore, to the order of Messrs. Morton & Williamson, naval architects, Glasgow, for Messrs. Duncan M'Neill & Co., of Calcutta and London, lately successfully performed her trials. This steamer has been built specially to suit her owners' coasting service in India, carrying a moderate cargo with a light draught of water. The dimensions are—150 ft. by 26 ft. by 11 ft. moulded. When loaded with cargo to her usual deep draught a mean speed was maintained of 11¼ knots per hour. The *Jattra* is fitted for a few first-class passengers, and also to carry a number of natives. There is an installation of electric light, also steam-steering gear and other modern requirements. The engines are on Rankine's patent disconnecting triple-expansion principle, one set of engines driving the two propellers, thus reducing the number of bearings and working parts requiring attention both when running and during an overhaul. Air pumps are fitted to both engines and a separate centrifugal pump, so that either propeller can be driven independently of the other. With one propeller only working the engine connected therewith acts as a compound condensing engine. The engines, for handiness, are fitted with steam-reversing cylinders. Steam is supplied by one boiler working under assisted draught. The trials were attended by Mr. Bain on behalf of the owners, and by Captain M'Phail, who takes the vessel to India.

St. Lawrence.—Messrs. T. Hamling & Co., Limited, of Hull, have had another steam trawler added to their extensive fleet, viz., the *St. Lawrence*, and she has just completed her trial. The vessel is 110 ft. long, 21 ft. broad, 11 ft. deep, and is propelled by triple-expansion engines of 60 N.H.P., so she will be one of the largest and most powerful trawlers sailing out of Hull. It is worthy of note that the owners, who are ever to the fore in the various improvements, have had Stones' patent bronze propeller supplied to her, which will considerably improve her speed. The trial was satisfactory in every way, the weather being all that could be desired, and the party on board were well satisfied with the behaviour of the ship and the speed attained. The company on board included Alderman Hall, Miss Hall, Messrs. T. Winn, G. Everingham; S. Clark, of Beverley; Thos. Dunston, of Thorne; J. R. Hainsworth, T. Morrill, C. Smith, R. Martin (owners' surveyor), G. H. Strong, Good, and Captain Walter Agerskow. The ship has been built by Messrs. Cochrane & Cooper, of Beverley, and engined by Messrs. C. D. Holmes & Co., of Hull. Mr. A. Cochrane represented the shipbuilders, and Messrs. C. D. Holmes and J. R. Smith, the engineers.

Pointer.—The steamship *Pointer*, built by Messrs. A. & J. Inglis, for Messrs. G. & J. Burns, went on her trials lately with an eminently satisfactory result, as on a trial of six consecutive runs between the Cloch and Cumbrae Lights she developed a speed of 14½ knots, being three-quarters of a knot in excess of the guarantee. The *Pointer* is a steamer similar to the *Spaniel* built last year by Messrs. Inglis for Messrs. Burns. During the winter the *Spaniel* has been in the Glasgow, Greenock, and Belfast Royal Mail service, where she has proved as popular with passengers as she did last summer in the Glasgow and Liverpool service, which service she has again been placed on. The *Pointer* sails to Liverpool next Friday, and she and the *Spaniel* will conduct a service five times a fortnight between Glasgow, Greenock, and Liverpool, and as Messrs. Burns have arranged particularly cheap fares available by these steamers, which are fitted with every modern improvement and luxury, the service is one which is sure to grow in popularity with the public.

Ibadan.—On April 24th the twin-screw steamer, *Ibadan*, went her official trip and in every respect more than fulfilled the expectations of all concerned—the mean speed attained being 11⅛ knots per hour, and the combined H.P. exceeding 800. The *Ibadan* has been built by Messrs. David J. Dunlop & Co., Inch Works, Port-Glasgow, for the African Steamship Co., of London, and is intended for their branch service on the West Coast of Africa, her principal dimensions being:—Length between perpendiculars, 204 ft.; breadth moulded, 35 ft., and depth, moulded, 13 ft., with a gross tonnage of 800 tons. The steamer has been built under the direct supervision of the Board of Trade, and fulfils all their requirements for carrying passengers. It is worthy of note—showing the facilities the builders can command at their wharf for putting heavy lifts on board—that from the time the vessel was launched till the trial only ten working days elapsed, and this, together with the gratifying results obtained last Friday on trial, reflects the utmost credit on the Messrs. Dunlop for the expeditious and satisfactory manner in which the steamer has been got ready. Captain Rattray superintended the construction of the *Ibadan* on behalf of the owners, whilst Mr. Stevenson, the company's superintending engineer, acted as machinery surveyor. At the trial the owners were represented by Mr. Stevenson, Captain Barrow, commander, and Mr. Elliot, chief engineer, whilst the builders were represented by Mr. Jas. L. Dunlop. Immediately after the trial the guests were transferred to the tug in attendance, and the *Ibadan*, under the joint charge of Captain Barrow and Mr. Evans, Liverpool pilot, left the Cloch shortly after two o'clock steaming easy all the way, and was berthed in the Queen's Dock, Liverpool, in the remarkably short time of 19 hours. The machinery throughout the trial passage to Liverpool worked with perfect smoothness.

Owl.—On April 25th the steam trawler *Owl*, the first of two built by Messrs. Edwards Brothers, North Shields, for the Cleethorpe Steam Trawling Co., Limited, of Grimsby, went on her trial trip. The *Owl* is built of steel throughout to iron scantlings, and of the following dimensions: 95 feet over all by 20 ft. beam by 10 ft. 6 in. depth. The machinery, constructed by the North-Eastern Marine Engineering Co., Sunderland, consists of triple-expansion engines, having cylinders 10 in., 16 in., and 26 in. in diameter by 19½ in. stroke, supplied with steam by one single-ended steel boiler; working pressure 200 lbs. An average speed of 10 knots was obtained on trial. The vessel was built to specifications and superintended by Mr. R. B. Kennedy, A.M.I. Mech. E., consulting engineer, Grimsby.

Kelvin.—On April 29th the s.s. *Kelvin*, built by Messrs. Short Brothers, Sunderland, to the order of the Glasgow Steam Shipping Co., of which Messrs. J. Black & Co., of Glasgow, are the managers, went out on trial, and after compasses were adjusted was run over the measured mile. After a series of runs a mean speed of 12½ knots was attained, which was considered very satisfactory, the engines working with perfect smoothness and absence of vibration, steam being easily maintained at a pressure of 180 lbs. This vessel has been constructed in excess of Lloyd's requirements for the highest class, and is of the following dimensions:—Length, 316 ft.; breadth, 42 ft.; and depth, moulded, 26 ft. 9 in., with cargo poop and large house on bridge deck, fitted up in polished hardwoods for the accommodation of captain, officers, &c., open bridge amidships, with engineers' accommodation on top; chart-house on flying bridge, steering engine placed on engine-room platform, with controlling gear from flying bridge; and topgallant forecastle fitted up in commodious compartments for petty officers and crew. The double-bottom throughout is constructed on the cellular principle, divided into trimming compartments for water ballast. A large vertical multitubular boiler supplies steam to six powerful steam winches for working cargo. In order to leave the holds clear for cargo deep framing and side girders have been substituted for beams and web frames. The engines have been supplied and fitted by Messrs. W. Allan & Co., Limited, of Sunderland, and work at a pressure of 180 lbs., the boiler being fitted with Howden's forced draught. During construction the ship and engines have been superintended by Mr. George M'Farlane, of Glasgow, assisted by Captain O'Neal, who has taken command of the vessel.

Sapucaia.—On May 1st the twin-screw steamer *Sapucaia*, built by Messrs. A. Rodgers & Co., of Port-Glasgow, and engined by Messrs. Hall-Brown, Buttery & Co., of Govan, was successfully tried on the Gareloch measured mile, when the mean speed was found to be 10·3 knots, being rather more than 1¼ knots above the guaranteed speed. This result is highly satisfactory to the owners, the builders, and the engineers, the more so that barely three months have elapsed from the placing of the order. It may be said that the steamer is the first of a new type of steamers for the Amazon Steam Navigation Co., being intended solely for cargo purposes. It is to be hoped that the new departure will be a great success, and that the performance of the steamer in actual service will enhance the reputation of the company's able superintendent, Mr. Jas. Pollock, as well as that of the shipbuilders and engineers. The steamer and her engines have been superintended locally by Mr. Williams, of Glasgow. The *Sapucaia* is purely a cargo-carrying steamer, intended for service in shallow waters, and her trial was run with full cargo on board. The engines are twin-screw triple-expansion engines, with a large boiler working at a pressure of 160 lbs. The vessel has two steam winches, steam steering gear, Mumford's duplex pumps, Worthington's sanitary pumps, and every convenience for the officers and crew, as well as for the economical and efficient handling of the cargo. The *Barcellos*, a sister ship to the *Sapucaia*, by the same builders, is at present lying at Cessnock Dock crane, where the machinery (also by Messrs. Hall-Brown, Buttery & Co.), will be put on board. Her novel appearance, so different from cargo steamers trading with this country, causes general comment.

Lynrowan.—On May 5th the s.s. *Lynrowan*, built by Messrs. William Hamilton & Co., Port-Glasgow, for the Liver Shipping

Co., Limited, of Liverpool, proceeded down the river to undergo her trial trip. The vessel, which has been designed for the company's general and Eastern trade, is 310 ft. long by 42 ft. 6 in. beam, by 21 ft. 9 in. moulded to main deck, with a nett register tonnage of 1,797 tons, and is capable of carrying 4,300 tons deadweight on a light draught. She is classed at Lloyd's 100 A1, partial awning deck type, and is fitted throughout with all the newest requirements for the quick loading and discharging of cargo, and for the working of the ship. The machinery, which has been constructed by Messrs. David Rowan & Son, of Glasgow, is on the triple-expansion system, having cylinders 22 in., 36 in., and 60 in. by 42 in. stroke, steam being supplied by two large boilers of 160 lbs. working pressure. The trial was most satisfactory, the mean speed on the measured mile being close on 11 knots, the engines working smoothly all day. The builders and engineers were represented by Mr. William Hamilton and Mr. James Rowan, Mr. Sproule, of Messrs. Johnston, Sproule & Co., the managers of the Liver Shipping Co., Limited, who, along with Mr. J. Daglish, of the firm of Ashlin & Co., consulting engineers and naval architects, of Liverpool and London, who have superintended the construction of both hull and machinery, represented the owners. In the evening the vessel proceeded to Newport *via* Barrow to load for Bombay, under the command of Captain M'Neill.

Sir John Coode.—On Tuesday, May 5th, the above-named vessel, constructed by Messrs. Wm. Simons & Co., Limited, for the Crown Agents of the colonies, underwent its official dredging and steaming trials with most satisfactory results. The dredger loaded her hoppers of 900 tons capacity in 70 minutes in the great tidal harbour, Greenock, and thereafter proceeded to the measured mile at Skelmorlie, when four runs were made, with the result that a mean speed of 9½ knots was obtained, being a knot above the contract conditions. The dredging and propelling machinery worked most satisfactorily. The vessel then returned to Renfrew to be fitted out for the voyage to Colombo, Ceylon. Messrs. Coode, Son & Matthews, the consulting engineers for the Government of Ceylon, were present at the trials, assisted by Mr. Wilson Wingate, N.A., London, superintending engineer, and Mr. Robert Anderson, inspecting engineer.

Inchmona.—An unusual amount of interest has been exhibited in connection with the trials of the s.s. *Inchmona*, on 5th and 6th May, owing to the machinery being in many respects different to that now regularly fitted. The vessel was built by Messrs. Wm. Gray & Co., Limited, of West Hartlepool, to the order of Messrs. Hamilton, Fraser & Co., of Liverpool. She is an ordinary cargo carrier of very full model, being 335 ft. in length, by 46 ft. 6 in. beam, and carries 5,000 tons deadweight on 20 ft. 6 in. draught. She is therefore of the very shallow draught type, of which Messrs. William Gray & Co., Limited, have turned out during the past twelve months about a dozen examples. The new departure in the engine-room consists generally in the adoption of a number of details tending towards the economy of fuel, with a view to arriving at once at a substantial reduction in the coal consumption now current. The first point of importance is that the boiler pressure is raised to as high as 255 lbs. per square inch working pressure, the boilers having been tested by Lloyd's to 510 lbs. per square inch. And secondly, in the supply of the first set yet built of Mr. Mudd's patent five-crank engines, which are regarded on the one hand as highly advantageous in themselves, and on the other, as especially applicable in the case of large powers for the use of high pressure steam. With these engines and boilers, which we should mention were built at the Central Engine Works, West Hartlepool, the builders felt confidence in holding out to the owners the expectation that the coal consumption would not be over 1·15 lbs. of Welsh coal per horse per hour, and had hopes of getting still closer down to the ideal consumption of 1 lb. of coal per horse per hour. These predictions were based upon the calculations of the accumulated economies to be had from the various steps included in the scheme. The boilers are of the ordinary multitubular type, but are fitted with Ellis & Eaves' well-known system of induced draught, supplied by Messrs. John Brown & Co., Limited, Sheffield, and also with their Serve tubes, which have the effect of increasing the heating surface without increasing the size of the boiler. On the trials steam was easily maintained at 255 lbs. pressure, whilst the engines were running steadily at about 80 revolutions per minute, with the induced draught fan running at as easy a speed as 180 to 200 revolutions per minute. Combined with the induced-draught system there is also an arrangement of tubular superheater, manufactured at the Central Engine Works, for drying and slightly superheating the steam on its way to the engines. The steam is further kept in a dryer state than usual throughout its progress through the engines by an exceptionally complete system of steam jacketing, and the feed water is returned to the boilers at a much higher temperature than ordinarily, viz., at about 400 degrees Fahr., by a system of feed-heaters that have been made at the Central Engine Works. The most interesting feature, however, is the arrangement of the engines on five cranks, there being two low-pressure cylinders, and the cranks being set at equal angles around the crank path. This gives so even a balance of forces, such relatively light reciprocating parts, and such rapid reversal of the up-and-down initial stresses, as to enable the engines to run almost noiselessly and entirely to obviate vibration of the ship, even when light. All the valves are on the centre line of the ship, and are driven by ordinary link motion, the work on the valve gear being unusually light, owing to the smallness of the valves, and the power passing through each crank being only one-fifth of the total instead of one-third, as in the three-crank engine. The smallness of the low-pressure cylinders enables the centres of the engines to be closer than usual, and the engines altogether go into an engine-room only one frame space longer than is usual with the three-crank engine. The trials were continued over two days, during which time the boilers and all steam joints remained absolutely steamtight and the engines ran in the most satisfactory manner possible. No bearing of any kind showed the slightest sign of warming, and although the engines were run for many hours at 80 revolutions per minute no difficulty of any kind arose, and at the conclusion of the trials the vessel proceeded on her first voyage up the Baltic. The coal used during the trials was carefully weighed for four separate runs in the presence of four separate groups of visitors, who were taken off to the vessel by tug, the results being of a character to entirely justify the predictions of the builders. On the first run the consumption was 1·142 lbs. of coal per horse per hour; on the second run, 1·078 lbs.; on the third run, ·999 lbs.; and on the fourth, 1·069 lbs. The average of these is 1·07 lbs. of north country coal per horse per hour, which will be recognised by all interested in the question of fuel economy at sea as a very remarkable result, and if it can be maintained in regular sea service, there can be no doubt that the machinery of the *Inchmona* will mark the beginning of a new and important step in advance in marine machinery. The vessel and her machinery have been built under the continuous personal supervision of Mr. J. B. Edmiston, the superintendent engineer to Messrs. Hamilton, Fraser & Co., whose name is so well known in connection with his patent feed-water filters, of which there are several on board the *Inchmona*. The various groups of visitors to these trials included many distinguished engineers and shipowners, amongst whom we may mention Mr. Anstey, representing Mr. Durston, engineer-in-chief to the British Admiralty; Mr. Milton, chief engineer surveyor to Lloyd's Registry; Mr. Hamilton and Mr. Fraser, owners of the steamer; Mr. J. B. Edmiston, superintendent to the owners; Mr. Young, superintendent engineer to Messrs. Shaw, Savill and Albion Co., Limited, London; Mr. Headlam, superintendent to the "Gulf" Line; Mr. Lockett, of Liverpool; Mr. Lawson, Glasgow; Mr. Fothergill, superintendent to Messrs. Herskind & Co., West Hartlepool; Mr. Kitching, superintendent to Messrs. Furness, Withy & Co., Limited, West Hartlepool; Mr. James Airey, West Hartlepool; Mr. Reid, of Messrs. Palmer's Co., Jarrow; Mr. Sage, inspecting engineer, Hull; Mr. Strong, inspecting engineer, Hull; Mr. Rooke, superintendent engineer to Messrs. Ropner & Co., West Hartlepool; Mr. Birst and Mr. Austin, local engineer surveyors to Lloyd's; Mr. C. S. Swan, of C. S. Swan & Hunter, Wallsend: Mr. Westgarth, Middlesbro'; Captain Watson, West Hartlepool: Mr. Eaves, representing John Brown & Co., Ltd.; Mr. Graham, Newcastle; Mr. Gray, representing the builders of the ship; Captain Murrell, Hartlepool; Mr. Baines and Mr. T. Mudd, representing the engine builders. The results obtained at sea, after a voyage or two have been made, will be looked forward to with much interest by shipowners and engineers.

Southend Belle.—On May 5th the new paddle-steamer *Southend Belle*, built by Messrs. Wm. Denny & Bros., and engined by Messrs. Denny & Co., Dumbarton, for the Belle Steamboat Co., London, went down the Clyde on her trial trip. The steamer is

249 ft. long by 30 ft. broad by 10½ ft. deep, and when on her runs between London and Clacton-on-Sea will carry about 2,000 passengers. She has engines of the direct-acting triple-expansion diagonal surface-condensing type, and is fitted with feathering steel floats. She is also fitted with two navy type boilers, working at a pressure of 160 lbs. to the square inch. She has forced draught on the closed stokehold principle, the air being supplied by a fan driven by a Bumstead engine. She is also supplied with Messrs. Denny & Co.'s patent arrangement for arresting the sparks and dust thrown out by the forced draught. She is fitted with Brown's steam and hand steering gear. The steamer is most luxuriously fitted for her passenger accommodation. She has a most handsome saloon framed in polished sycamore, with decorated panels and square lights in the sides and ends. The panels are filled in with lincrusta, decorated, and gilded, and the upholstery is blue frieze velvet, the windows being curtained with blue and gold tapestry. The dining saloon is capable of dining 120, whilst there is also a ladies' boudoir, private cabins, and private dining accommodation. She is fitted throughout with electric light, whilst the ventilation has been well attended to. At the trial yesterday there were present representing the company, Mr. A. Penfold, L.C.C. and J.P., chairman of the Belle Co.; Mrs. and the Misses Penfold, Mr. Mitchell, Miss Mitchell, and Miss Heinman; Mr. Spence, manager of the company; and Mr. Dugald Brown, superintending engineer, as representing the builders; Mr. Walter Brock, Mr. James Denny, Mr. John Ward, Mr. R. B. Pope, along with a number of invited guests. On Saturday on the measured mile the *Southend Belle* attained a speed of 21 miles an hour, her guarantee being 19 miles. Yesterday on her trials she developed a speed of 20¼ miles. On the home journey dinner was served in the saloon. Mr. Walter Brock presided, and proposed "Success to the Belle Steamboat Co. and the *Southend Belle*," alluding to the splendid vessels already owned by that company, and the handsome addition which was just being made by the *Southend Belle*, the fourth steamer built by their firm for this company. Mr. Penfold made a happy reply, remarking that his company was determined to have the best boats possible, and so stand in the front rank of the trade on the Thames. He also proposed "Success to Messrs. Wm. Denny & Co." for whom Mr. James Denny appropriately replied.

Dona Catalina.—On May 6th the steamer *Dona Catalina*, lately built for Buenos Ayres by Messrs. John Fullerton & Co., and engined by Messrs. Ross & Duncan, had a successful trial trip, the mean speed attained coming quite up to expectations. Among those present were Mr. Duncan and Mr. Rankin (of Ross & Duncan), the Messrs. Fullerton, and Mr. D. S. Ker (of F. W. Allan & Co.), who represented the owners. At luncheon, "Success to the *Dona Catalina* and her owners" was proposed and honoured, and replied to by Mr. Ker. The steamer leaves shortly for her destination, under the command of Captain Maver.

Scud.—On May 7th the steam yacht *Scud* went on her official steam trials on the measured knot at Stokes Bay when the remarkable mean speed of 20½ knots was attained. She is a steel yacht of about 90 ft. water-line length, and built by Mr. John Samuel White, East Cowes, on exceptionally light scantlings. Her owner is Mr. A. H. E. Wood, late owner of the steam yacht *Rona*, which was sold last season to Baron Rothschild. Electric light installation is supplied throughout, and a large projector placed forward; also a neat steam steering engine has been supplied by the builder. The engines, by Mr. John Samuel White, are of the triple-compound type, with a water-tube boiler supplying steam at 200 lbs. It may be mentioned that the vessel has been designed and constructed on the patent "turn-about" system of Mr. White, having the after dead wood cut away and double rudders inserted.

Steam Hopper Barge.—On May 11th the trial trip of the last of the three steam hopper barges ordered by the Admiralty and constructed by Messrs. William Simons & Co., Limited, of Renfrew, took place at Skelmorlie with very satisfactory results. Six runs were made with and against the tide, and it was found that a speed of 9¼ knots was obtained, which was over the contract amount. The Admiralty were represented by Messrs. Hay, Stewart and Scoggins, and the builders by Mr. William Brown.

Sigurd.—On May 11th this vessel had her trial trip. She is a fine steel screw steamer, 285 ft. in length; breadth, 39 ft. 6 in.; and depth 19 ft. She has been built to the order of Mr. L. H. Carl, of Copenhagen, and takes Lloyd's highest class. The deck erections consist of poop, raised quarterdeck, and partial awning deck. A handsome saloon, state-room and accommodation for captain and officers have been fitted up in the poop, and comfortable quarters for the engineers amidships, and for the crew forward. The hull is built with web-frames and cellular double bottom, and with large ballast tank in the after peak. Four steam winches, large patent donkey boiler, steam steering gear placed in engine-room casing, hand screw steering gear aft, direct steam windlass, schooner rig, boats on beams overhead, grain divisions, and all improved appliances for working the steamer have been provided. The engines are of the triple-expansion type, working on three cranks, and have been supplied by the Central Marine Engine Works of William Gray & Co., Limited, the cylinders being 21 in., 33 in. and 56 in. diameter, with 36 in. piston stroke, and they are supplied with steam by two large steel boilers working at a pressure of 160 lbs. per square inch. The vessel went out in the early morning and adjusted compasses, and at 10 a.m. a tug took on board Mr. Krebs, Lloyd's representative at Copenhagen; Captain Jorgensen, who has superintended the building of the ship and her machinery on behalf of the owner; Messrs. Hans Nielsen and Charles Nielsen; Mr. George Smith, Captain Murrell representing the builders of the ship, and Mr. T. Mudd representing the engine builders. The engines were run at full speed till the vessel had made several runs on the measured mile off Sunderland, the average speed with and against the tide being over 12 knots. The contract in this instance stipulated that the vessel should be capable of steaming 9½ knots light on 12 tons of coal per day. To satisfy this condition the engines were reduced in speed and the coals weighed, when it was found she was capable of doing 10½ knots per hour on the measured mile on a consumption of eight tons of coal per day. Everything ran in the most satisfactory manner possible, and on the completion of the trials in the afternoon the vessel was taken into Sunderland to take in her first cargo. She is under the command of Captain Jorgensen, and will leave in a day or two for the Baltic. The representatives of the owner expressed their great satisfaction with the manner in which the work had been carried out both in the shipyard and engineering departments, and at the highly satisfactory character of the results of the trial. A sister ship is in hand for the same owners, which was launched during the same week.

Leitrim.—On Tuesday, May 12th, the s.s. *Leitrim*, a fine spar-decked steamer built by C. S. Swan & Hunter, Limited, of Wallsend, for R. M. Hudson, Esq., of Sunderland, proceeded to sea on her trial trip. The vessel, which has been specially designed and constructed for the conveyance of frozen meat from the River Plate to the United Kingdom is 365 ft. B.P., by 48 ft. 6 in. beam, by 30 ft. 4 in. depth moulded, and has been constructed to the highest class at Lloyd's for the carrying of a deadweight cargo of about 6,500 tons. Two of the holds have been completely insulated for the conveyance of frozen mutton, and have an internal capacity of about 100,000 cubic feet capable of carrying about 41,000 carcases. The refrigerating machinery, which is of the latest type, has been supplied by Messrs. The Linde British Refrigeration Co., Limited, on their system of ammonia and brine pipes; whilst for rapid handling of the frozen meat, as well as the deadweight cargoes, a large number of steam winches with horizontal auxiliary boiler, which also supplies steam to the refrigerating plant, &c., and a complete system of quarter breadth derrick posts and derricks have been fitted in suitable positions, so that loading or discharging may be carried on at both sides of the vessel simultaneously. The derrick posts have been made of an unusual length, so that in the event of the vessel carrying cattle on the upper deck, the derricks will work over all; and the upper and 'tween deck arrangements generally have been so planned to enable the vessel to carry a maximum number of live cattle, in the event of her being fitted for this branch of the meat trade; and anticipating this the 'tween decks are ventilated by Blackman's patent steam fans. The steering gear is of the new type of hydraulic gear supplied by Messrs. Fawcett & Preston. The machinery has been constructed by the Wallsend Slipway and Engineering Co., Limited, and has cylinders 24½ in., 40 in., and 68 in. diameter, by 48 in. stroke, supplied by steam at 180 lbs. pressure by two large boilers fitted with Serve tubes and Ellis & Eaves' system of induced draught. The whole of the machinery worked without a hitch and to the entire satisfaction of all connected therewith, and during the progress of speed trials the mean speed attained was about 12½ knots. During the construction the vessel and machinery have been superintended by Mr. T. Graham on behalf of the owners, and he, together with Mr. R. M. Hudson., jun., was present on the trial trip. The builders were represented by Mr. G. B. Hunter and Mr. C. Stephenson ; the engineers by Mr. L. Rusden ; Messrs. John Brown & Co. by Mr. Gross and Mr. Brown, and the Linde British Refrigeration Co., Limited, by Mr. Westwood. After the trial trip the *Leitrim* sailed for Barry Dock, where she arrived after a satisfactory run of 64 hours, and where she will load cargo for the river Plate.

Ogun.—On Tuesday, May 12th, the s.s. *Ogun*, which has been built to the order of Mr. G. L. Gaiser, of Hamburg, for the Lagos trade by the Dundee Shipbuilders Co., Limited, successors to Alex. Stephen & Sons, Dundee, ran her official trial trip on the Tay, which proved highly satisfactory. The engines, constructed by J. & H. Whyter Cooper, of Dundee, worked without a hitch, and a speed of 9½ knots was maintained throughout a run of four hours with the vessel fully loaded, being half a knot over the guaranteed speed. The dimensions of the boat are as follows :—153 ft. by 24 ft. 1 in. by 10 ft. 5 in., with a gross tonnage of 350 tons. The vessel is flush deck, topgallant forecastle, large casing over engines and boiler, with deck above extending full breadth of vessel, with chart-house on top and fly bridge ; large teak house aft for the accommodation of officers and engineers. Triple engines with cylinders 12⅝ in., 20½ in. and 34 in., by 22 in. stroke, one large boiler 165 lbs. working pressure, steam windlass, hand steering gear aft and amidships, two steam winches. The owners were represented by Mr. Brettschneider, junr., son of the principal owner, and there were also on board Mr. Thompson, Lloyd's surveyor, Mr. G. E. Kidd, secretary of the company, and a large number of friends, all of whom were highly satisfied with the result of the trial.

Elisabeth Rickmers.—On May 12th the s.s. *Elisabeth Rickmers* went for a trial trip off the mouth of the Tyne. The steamer has been constructed by Messrs. Wigham Richardson & Co., to the order of Messrs. Rickmers, Reismuhlen Rhederei, and Schiffbau A. G., of Bremen, for their well-known Eastern service. She is built of steel, on the web frame principle, 427 ft. in length, 50½ ft. beam, and 30 ft. in depth, and will carry 7,200 tons dead weight. The engines are of the quadruple-expansion type, self-balanced on the Yarrow, Schlick and Tweedy system, and working at 215 lbs. pressure. A large company of visitors were present at the trial trip, including Mr. Paul Rickmers, Mr. A. Heine, under whose superintendence the vessel has been built, Mr. J. Denham Christie, Mr. Patterson and Mr. Muir, of the builders' firm, Mr. A. Gulston, of Sir W. G. Armstrong & Co., Mr. Duckitt, &c. During the trial the machinery worked in a most satisfactory manner, and immediately on the conclusion of the trip the vessel sailed for Middlesbrough, under the command of Captain Andresen, to load.

Norden.—The steel screw steamer *Norden*, built by Messrs. Richardson, Duck & Co., and engined by Messrs. Blair & Co., was taken to sea for her trials on Friday, May 15th. Mr. Peter Brown, managing director, and Capt. Plum, director of the Dampskibs, Selskabet, Norden, Copenhagen, accompanied by Mrs. Brown and Mrs. Plum, and other friends, were on board, together with representatives of the builders and engineers. After adjusting compasses, the vessel proceeded to Sunderland Bay, where it had been arranged to make the trials of speed and consumption. In spite of somewhat adverse conditions of weather, a mean speed of over 11 knots was obtained on a consumption equal to about 14 tons per day. After the trial trip the vessel returned to Middlesbro' for bunkers, and sailed the next day.

Kherson.—Much more than ordinary interest centred in the trial trip of the s.s. *Kherson*, which was made from the Tyne on May 16th. The vessel herself is of no ordinary type, and she was submitted to an exceptionally severe trial, while the fact that her steam power is generated in the new Belleville water-tube boilers is in itself a matter of special interest to engineers. The *Kherson* has been built by Messrs. R. & W. Hawthorn, Leslie & Co., for the Russian Naval Volunteer Fleet. She is the fifth vessel built by that firm for this fleet, and is of larger dimensions and greater speed than any of her predecessors. She is 492 ft. long, built on the lines of a yacht, and besides having accommodation for 74 first-class passengers and 1,450 emigrants, has space for 4,600 tons of cargo. She is a transport ship built as an armed cruiser, and has 24 Belleville boilers with 250 lbs. pressure and twin-screw engines of 13,000 H.P., also by the Hawthorn firm. Her ventilating, pumping and fire-extinguishing arrangements are very elaborate, and the accommodation for the first-class passengers has been studied to the point of luxury. A large portion of the vessel's space—no less than 160 ft.—is taken up by the steam generating and propelling machinery. The contract speed was 19½ knots, and in spite of a strong wind from the N.N.E. and a heavy sea, she made a mean over 12 hours' continuous steaming of 19·6 knots, at times doing over 20 knots. The Belleville boilers, we are informed, kept up a constant supply of steam over the whole of this time greatly in excess of what was actually required by the engines, and appear to have been thoroughly successful. A special commission of Russian gentlemen attended the trial, and saw that every condition was carried out to the letter, but expressed themselves as thoroughly satisfied with the results obtained. The *Kherson* is the largest and fastest passenger vessel that has yet been built on the Tyne, and is the most efficient and important craft that the Russian Naval Volunteer fleet have so far acquired. She is intended for transport service between Odessa and Vladivostock, and will leave the Tyne in a few days for the former port.

Jupiter.—On May 18th the paddle steamer *Jupiter*, which Messrs. Jas. & George Thomson, Limited, have built for the fleet of the Glasgow and South-Western Railway Co., completed her trials. Of her type the vessel is as fine an example as could possibly be produced on the Clyde, and the builders, whose resources are always taxed with more important work, are again to be congratulated on the success which invariably follows their efforts in the construction of fast paddle boats. The *Jupiter* is the fourth they have built for the company, and if not exactly the fastest of the four, internally she is as finely got up as any in the fleet. The average of her runs on the measured mile at Skelmorlie was 18½ knots, and on the four hours' trial a mean of slightly over 18 was maintained easily. Her station will generally be the Rothesay one, but on occasion she will relieve the *Glen Sannox*, and in either case is certain to repay the company for their enterprise in making their steamer service as nearly as possible the best in the kingdom. During the trial the weather was fine, though a trifle cold, and the company on board, on the invitation of the builders, greatly enjoyed the trip. Among the ladies and gentlemen present were Mr. Jas. Finlayson, Mr. Patrick Caird, Mr. David Cooper, Mr. Cockburn, Mr. Melville, Captain A. Williamson, Captain John Williamson, Mr. Morton, Mr. Herriot, Mr. George P. Thomson, Mr. Laurence M'Brayne, Mr. Thomas Wilson and Mrs. Wilson, Mr. J. G. Dunlop, Mr. Stewart, Mr. Ford, Mr. Geaton, Mr. Pearce, Mr. Howells, Mr. Easton and Mrs. Easton. At luncheon Mr. George Thomson, who presided, proposed "Success to the *Jupiter*," and Mr. Finlayson replied. Mr. Caird gave "The Builders," and Mr. Thomson responded. The party travelled to and from Prince's Pier by special train.

St. Elvies.—On May 18th the paddle steamer *St. Elvies*, built by the Fairfield Shipbuilding and Engineering Co., Limited, for the Liverpool and North Wales Steamship Co., Limited, of Liverpool, ran her official trial. This steamer is intended to run with the *St. Tudno*, built by the Fairfield Co. about five years ago, for the passenger traffic between Liverpool, Llandudno, and the Menai Straits. She is a splendid example of a pleasure steamer, fitted with all the latest improvements, and is certain to become a favourite on the Mersey. She is 250 ft. long, 28 ft. 3 in. beam, and 18 ft. 3 in. in depth, and has a magnificent appearance in the water. The trial consisted of four runs between the Cloch and Cumbrae lights, and a mean speed of 18¾ knots was easily attained—a result highly creditable to the builders, being half a knot in excess of the contract. The Fairfield Co. was represented at the trial by Mr. Shearer and Mr. Gracie, the managers of ship and engine departments respectively. Mr. Charles T. Ramsay, of Liverpool, under whose superintendence the vessel was built, represented the owners.

Carlow. — On May 19th the steel screw steamer *Carlow*, built and engined by Messrs. Blackwood & Gordon, Castle building yard, Port-Glasgow, for the City of Dublin Steam Packet Co., Dublin, went down the Firth on her official trial. The weather was favourable, and among the company who joined the steamer at Gourock were Mr. Wm. Watson, managing director of the City of Dublin Steam Packet Co. Captain George Bell, R.N., marine superintendent of the company, and Mrs. Bell, Liverpool ; Mr. E. G. Ferber, superintending engineer of the company, Liverpool; Mr. D. B. M'Geogh and Mrs. M'Geogh, Mr. F. P. and Mrs. Purvis, Mr. William Sloan, of Messrs. William Sloan & Co., Glasgow; Mr. William Watson, of the Clyde Shipping Co., Greenock; Miss Ethel Moore, Preston; the Rev. W. W. Burridge, Port-Glasgow; Mr. Arthur W. Archer, of the Drogheda Steam Packet Co.; Mr. Arthur D. Wedgewood, Dumbarton; Mr. John and Miss M'Gechan, Paisley; Mr. J. Haffield, Dublin; Mr. James and Miss M'Geoch, Paisley; Mr. Rowley, of the Board of Trade; Mr. Hugh Love and Miss M. Douglas, Gourock; Mr. James Mirrilies; Mr. Findlay and Mr. Charles Stewart, Glasgow; Captain and Mrs. Memry, Liverpool; Mr. W. Scharina, Glasgow; Mrs. Scobie, Port-Glasgow; Mr. W. A. Taylor, Liverpool; Miss Agnew, Miss Ross, and Miss Linton, Gourock. The *Carlow* is the fourth steamer which Messrs. Blackwood & Gordon have built for same owners. Her dimensions are:—Length, 260 ft.; breadth, 34 ft.; depth to main deck, 16 ft. 9 in., with full poop, long bridge and forecastle, having short breaks filled in with planking, which gives a continuous upper deck; gross tonnage, 1,284 tons. The vessel has been built very much in excess of Lloyd's scantlings in view of the particular trade for which she is intended—*i.e.*, Dublin to Liverpool—and has also been fitted with deep rolling chocks to minimise the rolling motion in heavy weather. She is fitted with powerful steam windlass, steam steering gear, and two large steam winches for the speedy loading and discharging of cargo. In the holds water ballast tanks are placed, which can be separately filled and emptied, being connected by pipes to ballast engines in the engine-room; above the bridge and poop decks boat decks are laid, on which are placed the six small boats which the vessel carries, and these decks will afford good shelter for passengers in wet weather. In the holds and 'tween decks and also on main deck, cattle-pens are fitted for the conveyance of 500 cattle, and on upper deck sheep fittings are arranged. Four large ventilators are fitted to the holds, and also automatic ventilation by fans placed in engine-room by pipes leading to the holds, by means of which efficient ventilation is provided in all parts of the vessel when fully loaded with cattle. The arrangements for the safe and comfortable transit of cattle have been carried out in accordance with the late order in Council regarding the same, the managing directors having given their special attention to this important matter. In the forward part of the vessel separate steerages have been provided for male and female passengers, and also a large and well-ventilated cabin for the sole use of cattle-dealers. On the bridge deck a comfortable smoking-room has been fitted up abaft wheelhouse, and over same a teak-house, containing the rooms for the captain and chief officer, has been arranged; above this house is placed the flying bridge, from which, on account of its height, the officer on watch has a clear look-out. On the poop deck a large and commodious house is fitted, having accommodation in private cabins for 30 first-class passengers. In the fore part of this house is the entrance to the main saloon, which is fitted up with accommodation for other 70 passengers, making 100 in all. The saloons are handsomely upholstered in velvet, and all the fittings and furnishings are arranged for the comfort and convenience of passengers, the sleeping cabins being spacious and well ventilated. Electric light by Siemens Bros. has been fitted all over the ship, including holds, saloon and forward cabins, and also large electric cluster lights for use on deck when working cargo. Above the house on the poop deck a promenade deck has been laid, railed round and seated, on which in fine weather the saloon passengers can have a pleasant and comfortable promenade. The machinery, which has also been constructed by Messrs. Blackwood & Gordon, is of the triple-expansion type, of fully 3,000 H.P., and is supplied with steam from two large double-ended boilers working up to 170 lbs. pressure, Weir's pumps, feed heater and evaporator, Allen's circulating engines, Harris's feed filter, Watt's circulators, Stone's bronze propeller, and all the latest improvements that can add efficiency to the machinery have been fitted. The vessel and her machinery has been constructed under the superintendence of Mr. E. G. Ferber, of Liverpool, the engineering superintendent of the City of Dublin Steam Packet Co.

The New Continental Express will commence the service in June between Tilbury and Ostend, and in July between Ramsgate and Ostend.

Reviews.

The Mechanism of Men of War. By R. C. Oldknow, R.N. London: George Bell & Co. 1896.

This is another of the useful series of Royal Naval handbooks. It is written by a Fleet engineer, and one is at once brought to the recognition of the fact that economical reasons have no part in his view of nature. Thus at page 3 he speaks of the paddle method of propulsion, and rightly speaks of the rarity with which the paddle is now employed. When paddle engines are now built, he says, the oscillating type is usual, but proceeds to say: "I am aware that diagonal engine cylinders . . . have been used lately with success . . . but I imagine the oscillating cylinder is hard to beat." Surely here we are not discussing the relative merits of the two types of engines merely, but the question of their adaptability to certain problems which have been put before the engine builder. A cylinder of large size has been needed for a certain purpose, whilst the depth of the vessel is strictly limited by the necessities of the work for which she is required. The diagonal engine has found a way out of the difficulty by enabling the requisite length of stroke to be given without putting the cylinder too high above the water line of the ship. Similarly we remember cases where the old-fashioned steeple engine has been used with conspicuous success for re-engining old ships. Another remark that seems to need explanation is of the same kind. At page 78 we read: "The use of triple-expansion engines in the Navy, though not quite, perhaps, universally approved, has become universal." What is the meaning of this insinuation against the triple-expansion engine? Why should any one object to it? Without multiple-expansion and high pressures it would be impossible to get full value out of the moderate coal supply which is allowed to war ships. High speed would be unattainable save for distances so slight as to be practically useless. The triple-expansion engine is necessary to the Navy, and will be until it is superseded by engines of more frequent expansions. Besides, what can be the objection to it? The three cranks set at angles of 120 degrees tend to minimise vibration as compared with the two-crank engine. The cylinders are smaller than in the compound engine, and the weights of pistons and suchlike are less.

Having mentioned these two matters we have done with anything that can be construed into adverse criticism. The task put before the author was not an easy one. He had to write for the unenlightened public about a highly technical matter, and had to begin with the alphabet of his profession. Yet the British public is apt to resent being too obviously instructed in the elements. Mr. Oldknow gets out of the difficulty by giving an account of a preliminary trial trip of an American warship, built by Americans for Americans, and described as an American, with all the high falutin descriptiveness which Americans love. There is in that no disguise on the part of the Transatlantic writer that his public need to be taught from the beginning. He even tells them that "abaft of all at the stern of the ship is the rudder." Mr. Oldknow goes through this wonderful account with comments upon the divergence of practice in American and British ships. He takes occasion here to dwell on two points which evidently affect his mind very deeply, as they must that of every thinking man who has a tithe of his knowledge about engineering matters in the Royal Navy. He laments the dearth of engineers in the Navy, and dreads the possible results to which that dearth may lead. He also has a very wholesome dread of high-forced draught, and dwells upon the danger and damage which attend its use. As he cannot say anything of his own in its favour, he very fairly quotes the defence made for it by the late able manager of the Barrow Naval Construction and Armaments Co. On the subject of liquid fuel, too, Mr. Oldknow quite states our own feeling when he says that he considers the fact that our supplies of oil would have to be drawn from the United States and Russia to be fatal to its introduction into our Navy. Yet the author is certainly not conservative in all matters, for he waxes enthusiastic over the water-tube boilers of the two new first-class cruisers, *Terrible* and *Powerful*, which are very fully described.

There is an interesting chapter on the auxiliary machinery which now forms so large a part of the engineer's charge on a war ship. H.M.S. *Vulcan*, with her complement of between ninety and a hundred engines, perhaps holds the record, but all other large modern ships get well over their half-century. With all this increase in their responsibilities it seems very unwise policy to reduce the numbers of engineers borne in men of war as shown in a later chapter. Possibly the Admiralty are forced to this policy by the scarcity of these officers in the service. It does not seem to occur to them that the right and simple thing is to largely increase their numbers. As a whole the book will be found most interesting to the general reader, and will tell him much that is new, whilst it should make him reflect upon the present condition of our Navy. The engineer will be interested, too, in the volume, though it does not profess to go deeply into engineering details. It discusses many questions in which all engineers are interested and it gives good accounts of some of the latest vessels afloat. The illustrations are numerous and well executed.

Know Your Own Ship. By Thomas Walton. London: Charles Griffin & Co., Limited. 1896.

THE present volume forms one of the very useful "Nautical Series" now being issued by the same publishers, and though primarily intended as text-books for the use of officers of the Merchant Navy, and students in naval architecture, they may well and profitably be read by all interested in matters appertaining to our national maritime progress.

A long connection with seamen, as lecturer to ships' officers at the Government Navigation School, Leith, has convinced the author of the work that mariners are not now satisfied with mere rule-of-thumb methods for their guidance, but desire to attain a thorough grasp of the principles of the subject they may be studying, and it is to aid them in fulfilling this laudable requirement that the author has been induced to contribute the present volume to the series.

Framed chiefly on a series of lectures delivered by him, the writer has adhered to the old-fashioned adage of "beginning at the beginning" and thoroughly and systematically thrashing out the subject as it progresses, and while endeavouring to cover as much ground as possible all prolixity has been avoided; indeed the matter has, so far as clearness allows, been admirably condensed, and in each chapter the language used, and the elimination of all laborious mathematical formulæ renders the contents of the book simple enough to be understood by every seaman.

The text of the work, aided by some 118 illustrations, deals most clearly with such diverse subjects as—to summarise the chapters in their order—Displacement and Deadweight; Moments; Buoyancy; Strain; Structure (a chapter of more than ordinary interest); Stability; Rolling; Ballasting; Loading; Shifting Cargoes; Effect of the Admission of Water into the Interior of a Ship; Sailing, Sail Area, etc.; Tonnage; Freeboard.

The above bald statement of the book will convey to the intending reader an idea of what he may expect to find in it, and in the space at our disposal we can only supplement it by stating that in our perusal of it we have found in its 230 odd pages no one statement that we could have wished differently expressed.

Like the other volumes of the series, the get-up of the book, both as regards printing and illustrations, leaves nothing to be desired, while its possession cannot but add greatly to the educational value of any seaman's library in which it may find a place.

Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships, from April 10th, to May 6th, 1896.

7507 W. H. Williams. Adjustable lever-action spanner.
7543 D. Best. Petroleum engines.
7551 E. J. Pennington and A. G. New. Propellers.
7603 F. W. Lanchester. Motive-power engine.
7618 J. Johannsen. Steering apparatus for ships.
7630 G. Walker. Ventilating arrangements of ships.
7632 W. J. Last. Heating steam engine cylinders.
7637 E. Gravesen. Tube scraper.
7639 J. Ciocki. Buffers for vessels.
7651 O. Meredith. Tubes for steam boilers.
7652 S. Y. Goddard. Welding lap-weld tubes.
7673 E. Emanuel. The "Haggard" boatswains' call.
7679 W. Logan. Silent door hook for ships.
7707 J. Finch and J. H. Rider. Upholstering ships' cabins.
7710 O. Imray (The Channel Bridge and Railway Company, Limited, France). Construction of submarine bridges.
7735 J. Wood. Metallic packings.
7756 W. Donald. Steam traps.
7757 J. O. Morgan. Packing for piston rods.
7764 P. Pinckney. Means for generating steam.
7785 J. Sanders. Protecting ships' bottoms, &c.
7800 W. Clarke. Motive power engines.
7808 J. F. Crease. Navigable battle forts.
7812 D. Weir. Drill chucks.
7831 J. Davis. Speed of vessels.
7838 T. Hineson. Steam boiler furnaces.
7844 W. Fairweather (The Babcock and Wilcox Co., United States). Flanging the man-holes in boilers.
7849 R. Anderson and W. Prentice. Disengaging boats on ships.
7850 R. Anderson and W. Prentice. Ships' davits.
7878 W. R. Jones. Furnaces.
7889 J. S., T. A., and E. R. Walker. Actuating the cut-off gear of Corliss and other engines.
7913 E. Johnson and J. Thompson. Furnaces.
7918 J. Murray. Steam boiler and other furnaces.
7941 J. A. Mays. Hardening steel plates.
7962 J. N. and W. Paxman and J. C. Peache. Centrifugal governors.
7978 J. H. Latham. Signalling on steamers.
7986 J. D. H. Reimer. Steam pipes.
8011 T. Mudd. Feed heaters.
8012 T. Mudd. Steam boilers.
8044 S. A. Johnson. Furnaces of steam boilers.
8049 C. W. Thompson. Valves of steam engines.
8065 S. Pitt (H. L. Gantt, United States). Regenerative furnaces.
8081 L. H. Moulun. Torpedoes.
8085 D. Munro. Operating bulkhead doors.
8097 D. Armstrong and J. Ashton. Hopper-feeding machines.
8098 W. H. Hill-Hartland. Treating furnace gases.
8107 J. Laird. Appliances for circulating water.
8108 O. Meredith. Furnaces for steam boilers.
8126 E. E. Middleton. Clearing ships of water.
8142 B. Jaffé. Apparatus for superheating steam.
8178 A. H. K. Smith. A collapsible boat.
8192 A. Hope and W. Arnold. Furnaces.
8197 R. J. Plunkett. Ramming of ships.
8202 E. L. Doyen. Flexible transmission shafts.
8203 J. Brown. Steering gear.
8249 D. Johnston and W. Mc Adam. Governing marine engines.
8250 T. O'Hara and J. R. and T. Ashmore. Valves.
8257 H. G. Fraser. Hose pipe couplings.
8268 W. White. Increasing speed of screw propellers.
8273 J. G. Nash and J. M. Borrow. Boilers.
8277 J. Hudson. Tubes.
8295 C. Hibberd. Lifeboats.
8317 L. O. Smith. Navigable vessels.
8322 G. Gallilee. Cellular double bottoms in ships.
8370 R. O. R. Russell. Wrenches.
8387 D. B. Morison. Stop valves.
8413 H. A. House and R. R. Symon. Construction of boats.
8447 A. Blechynden. Steam engines.
8448 Sir W. H. Bailey, A. J. Bailey, and T. Westerby. Condensing steam.
8478 E. Morton and G. Edwards. Reducing valves.
8499 J. Appleton an W. Cundliffe. Engine glands.
8504 B. J. Thomas, J. J. Taylor, and G. C. Thomas. Transferring barges, &c.
8521 L. le B. Mount. Feed-water heater for boilers.
8535 J. H. Rosenthal. Furnaces.
8537 M. F. G. Reece. Propellers.
8545 W. Boyes, jun. Smoke cowl with steam injector.
8553 J. Evans and A. Evans. Ships' anchors.
8554 J. Jackson. Steam and hydraulic vacuum gauge.
8555 G. McGhee. Internal combustion motor engines.
8601 P. A. Waller. Hydraulic engineering.
8604 E. J. Preston. High-pressure valves, &c.

8606 P. Giffard. Steam engines.
8608 R. Turr. Look-outs for use on board ship.
8611 W. Wright and F. J. P. Reed. Pilot light.
8622 T. Law. Waste or discharge valves.
8625 R. Brown. Ships' side lights.
8638 F. W. Walker. Screw-cutting lathes.
8639 R. A. Lewis. Furnaces.
8648 A. Willis. Tube-cleaner.
8665 G. Hough. Construction of vessels.
8673 W. P. Thompson (H. Brinkmann, Germany). Ships' propellers.
8674 W. P. Thompson (H. Brinkmann, Germany). Reversing gear.
8681 S. W. A. Noble and C. H. Murray. Cranes.
8687 H. Barcroft. Apparatus for propelling boats.
8694 S. H. Cobb. Folding binocular glasses.
8697 The Hon. C. A. Parsons. Steam turbine blades.
8698 The Hon. C. A. Parsons. Steam turbine blades.
8707 J. Hartmann. Charging valve for furnaces.
8758 A. W. F. Bennik. Steering wheels of ships.
8769 C. D. Abel (Dingler'sche Machinen Fabrik, Germany). piston slides.
8774 J. Brown & Co., and J. Nodder. Boiler furnaces.
8775 J. Brown & Co., and J. Nodder. Boiler furnaces.
8787 R. G. Brooke. Exhaust steam injectors.
8827 J. N. and W. Paxman and J. C. Peache. Centrifugal governors.
8832 H. A. House, sen., and R. R. Symon. Turbines.
8833 H. A. House, sen., and R. R. Symon. Anchors.
8835 B. H. Thwaite. Tubulous steam generators.
8845 W. Walker. Head for otter trawl net.
8855 J. F. Green. Propulsion of vessels.
8859 H. Barcroft. Apparatus for propelling boats.
8873 K. Lundkvist. Condensing steam engines.
8889 R. G. Morton. Engines.
8893 D. Robertshaw. Regulating steam engines.
8910 J. Scowcroft and E. Nightingale. Valves.
8911 R. Nightingale and J. Scowcroft. Steam traps.
8942 R. A. Smith. Propelling apparatus for ships.
8949 D. and F. D. Almy. Steam boilers.
8951 D. M. Thompson. Steam generators.
8955 G. Gascoine. Motive power engines.
8957 H. W. Handcock and A. H. Dykes. Reel for water tubes.
8987 J. Hopkinson and J. Lowis. Water gauges.
8992 G. Kürtösi. Turbines.
9001 R. Baird. Increasing the buoyancy of ships.
9002 R. Gee. Regulators for steam engines.
9004 C. H. Holgate. Valves.
9006 F. S. Pett. Boat disconnecting gear, &c.
9015 J. B. Murray and J. P. Turnbull. Raising vessels.
9042 W. P. Thompson (J. F. Hauser, Germany). Feed-water heaters.
9052 A. A. Loyal. Motors.
9062 J. R. Robson. Vertical and other steam boilers.
9064 G. Kyte & Co. Lubricating bearings.
9096 G. D. Macdougald. Propelling apparatus for ships.
9106 J. Phillips. Furling and reefing ships' sails.
9131 J. Miyabara. Water-tube boilers.
9145 R. J. White. Automatic steam governor.
9167 H. McClenahan. Lubricators.
9199 G. McGhee. Internal combustion motor engines.
9206 S. A. Johnson. Ships' divisional bulkheads.
9207 H. J. Dowsing. Increasing furnace combustion.
9214 A. Inokuty. Speed indicating apparatus.
9219 D. B. Morison and R. Cockburn. Bulkhead closer.
9221 J. Gordon. Protecting the bottoms of vessels.
9223 W. De H. Washington. Caissons for pier foundations.
9224 J. Hopkinson and J. Lowis. Stop valves.
9235 A. Montazeau. Feed-water for steam boilers.
9267 F. Edwards. Pressure gauges.
9272 J. Donald and W. Johnstone. Water-tight doors.
9303 G. Davidson. Trawl nets for surface fishing.
9307 A. G. Mumford and A. Anthony. Controlling feed-water.
9368 W. P. Thompson (W. R. Brüner and F. L. Anderson, United States). Maritime vessels.
9383 F. Wakefield. Propellers for steam ships.
9448 F. Pelzer. Centrifugal pumps and ventilators.
9454 C. Bellens. Steam engines.

BOARD OF TRADE EXAMINATIONS.

EXTRA FIRST CLASS.

May 2nd, 1896.	Metcalf, H. E...	Ex. 1C	London
,, ,,	Petheram, E. J.	Ex. 1C	Bristol
,, ,,	Roberts, C. W.	Ex. 1C	London
May 9th, ,,	Tannock, A. ..	Ex. 1C	Glasgow
,, ,,	Wilks, H. V. ..	Ex. 1C	Cardiff

NOTE.—1C denotes First Class; 2C, Second Class.

April 25th, 1896.

Adair, N.	1C	Glasgow
Brownlee, G. J.	2C	W.H'pool
Cook, W. H. C.	1C	,,
Corlett, W. H...	2C	,,
Croft, W........	2C	London
Davidson, J. ..	2C	,,
Downes, J. H...	1C	N.Shields
Doye, R.	2C	W.H'pool
Ferguson, J. M.	1C	Aberdeen
Galloway, R. T.	1C	W.H'pool
George, W.....	2C	Aberdeen
Gladstone, T. A.	2C	W.H'pool
Grandfield, F.W.	2C	Cardiff
Hicks, W. J. ..	2C	Aberdeen
Humphreys, P.	2C	London
Ingram, G.	2C	Aberdeen
Jones, S. D.....	2C	Cardiff
Loughlin, P. H.	2C	Liverpool
Mackieson, W. .	1C	Glasgow
Manthorpe, A.A.	1C	N.Shields
Mason, J. M. ..	2C	,,
McKenna, J. ..	1C	W.H'pool
McLuckie, A. ..	2C	Cardiff
McNeil, A. E. ..	2C	London
Miller, G. M. ..	1C	W.H'pool
Mills, E.	2C	Aberdeen
Moir, J...........	2C	Glasgow
Moor, J.	1C	N.Shields
Nicholls, T. H.	1C	Cardiff
Pride, W. E. ..	2C	Liverpool
Pollock, C. E...	1C	W.H'pool
Reed, E.	2C	,,
Rennie, J.	2C	,,
Steeves, A. G...	2C	Liverpool
Torrie, George .	2C	,,
Warren, T. B. .	2C	S'th'pton
Warwick, F. ..	2C	W.H'pool
Watson, S.	2C	,,
Wilkinson, C. ..	2C	S'th'pton
Wood, Lee	2C	Liverpool
Wright, T. K...	2C	N.Shields

May 2nd,

Anderson, D.W.	2C	N.Shields
Border, J. A. ..	1C	Sun'land
Burgess, T. H.	2C	London
Davie, A. B. C.	2C	,,
Douglass, W. ..	2C	Sun'land
Forster, Wm. E.	2C	Liverpool
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Nowell, Ed. P.	2C	,,
Roper, C. H. ..	2C	London
Stones, E. F. ..	1C	,,
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Thomson, J.M'L.	1C	Liverpool
Tiplady, A.....	2C	Sun'land
Watson, J.	1C	London
Wright, John ..	1C	Liverpool

May 9th.

Adolphsen, A. J.	1C	N.Shields
Blackie, A. L. ..	2C	London
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Buchanan, J. M.	1C	Glasgow
Davis, W. H. ..	1C	Cardiff
Farrar, J.......	1C	,,
Glaister, Robert	2C	Liverpool
Guinee, R.	2C	Cardiff
Howells, H.....	2C	,,
Hudson, G. C...	2C	London
Jones, C. N.....	2C	Cardiff
Lavis, Alex. R.	2C	Liverpool
Le Boutillier, E.	2C	London
Mackenzie, P...	2C	Glasgow
Mackie, W.	1C	London
McCallum, G...	1C	Glasgow
McFarlane, J...	1C	,,
McIntyre, D. F.	2C	London
McKenzie, R. M.	2C	N.Shields
Morley, M. P. ..	1C	Cardiff
Muir, W.	1C	London
Nairn, H........	2C	N.Shields
Nicholson, D. ..	2C	,,
Perkins, C. C. ..	2C	London
Pulley, F. W. ..	1C	,,
Rees, G. J.	1C	Cardiff
Reid, J. McL. ..	1C	Glasgow
Robertson, A. C.	2C	,,
Robertson, W.S.	1C	,,
Scarfe, J. H. ..	2C	N.Shields
Scourfield, T. ..	1C	Cardiff
Shaw, Robt. R.	2C	Liverpool
Slack, J. C.	2C	London
Slamin, A. E...	2C	Cardiff
Stevens, J.	2C	,,
White, A. F.....	2C	,,

May 16th.

Binnie, C. ..	1C	Greenock
Birnie, T. W.	2C	N.Shields
Boyen, C. ..	2C	,, ,,
Buchanan, P. D.	1C	Leith
Butt, T. J. G...	2C	London
Cooper, J. ..	2C	Leith
Davidson, J. ..	2C	,,
Forster, H. ..	2C	Greenock
Freeby, J. H. ..	2C	London
Galwey, C. H...	2C	Dublin
Good, R.	1C	Greenock
Halliday, J. E.	2C	N.Shields
Henderson, C.N.	2C	,, ,,
Howe, T... ..	2C	Hull
Keys, J. W. ..	2C	Leith
Lindsay, J. ..	1C	Greenock
Lonie, A.	2C	Leith
Little, C. E. ..	2C	Hull
Mason, A. ..	2C	London
Mitchell, J. C...	1C	Greenock
M'Knight, Wm.	1C	Liverpool
Nicholson, J. H.	2C	N.Shields
Reed, R.	1C	,, ,,
Ritchie, James	1C	Liverpool
Scott, J. B. ..	2C	Leith
Sinclair, J. ..	1C	,,
Smyth, Chas. A.	1C	Liverpool
Stewart, G. ..	1C	Greenock
Tungate, A. ..	2C	Hull
Waddell, W. A.	2C	N.Shields
Watson, J. ..	2C	Greenock
Williams, G. E.	1C	Dublin
Willis, J. E. ..	1C	N.Shields
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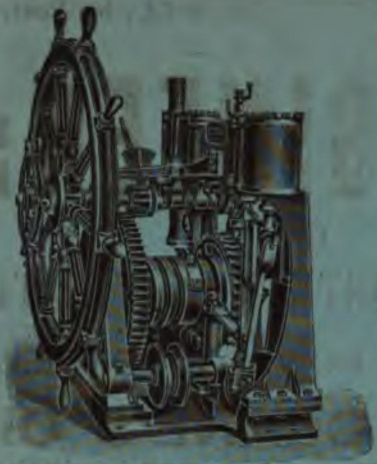

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MARINE ENGINEERS

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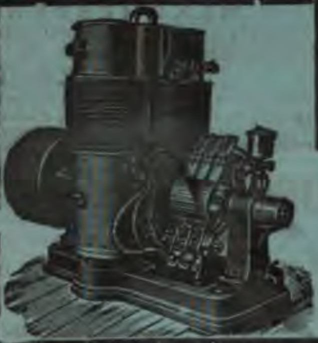

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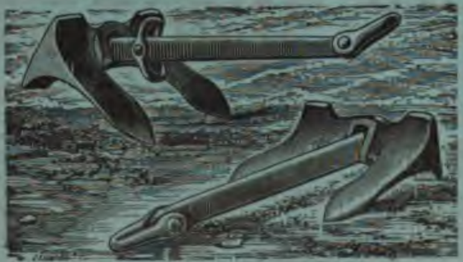

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The Marine Engineer.

LONDON, JULY 1, 1896.

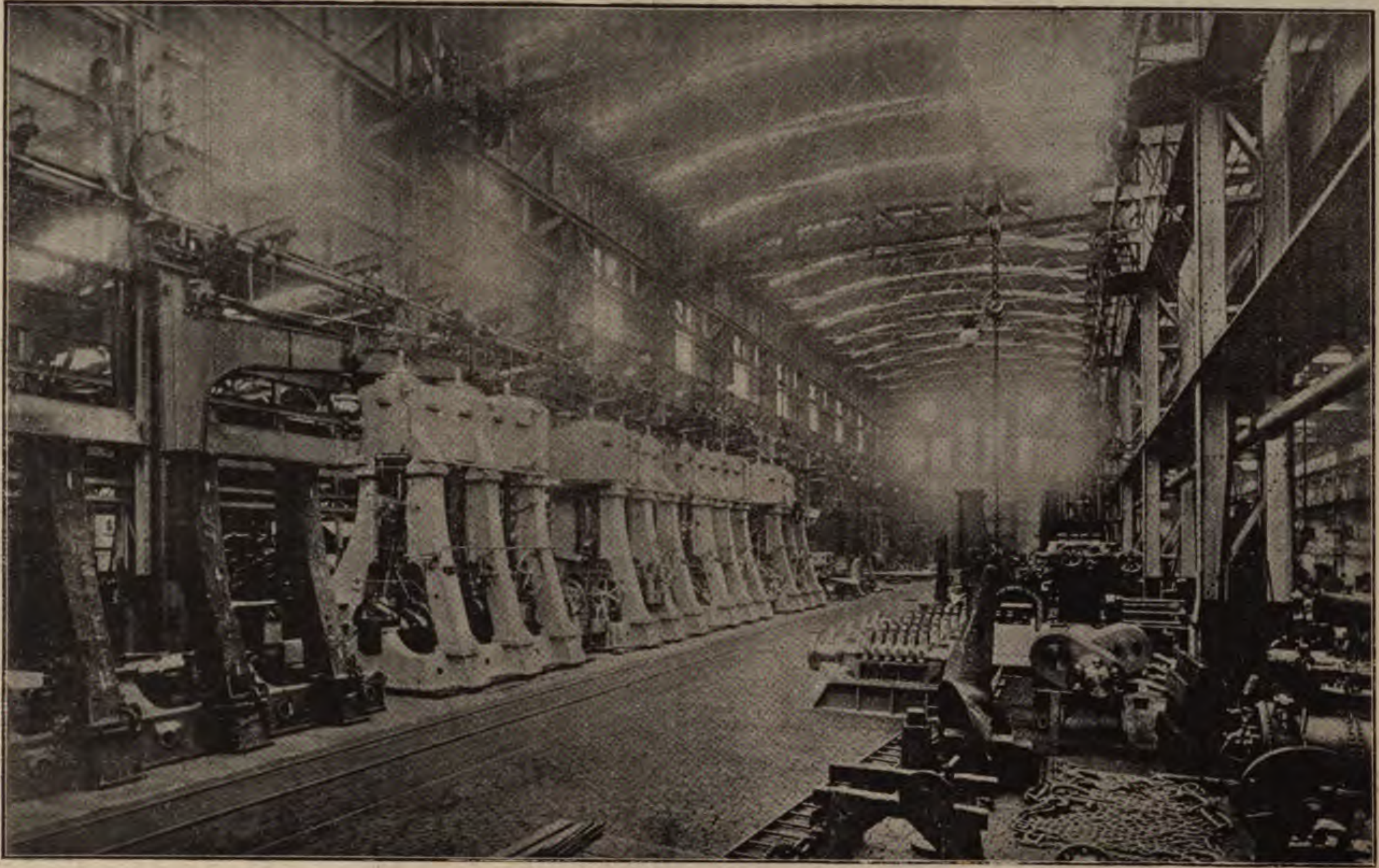
THE loss of the *Drummond Castle* has been the absorbing interest of the month of June. A great wave of sympathy and sorrow has swept over this country and over South Africa. It is a terrible thing to contemplate the sudden foundering of a great ocean liner, which is typical of the strength of man's brain in his constant battles with the forces of nature. For years this very vessel, as well as her fellows of the Castle Line, have pursued their way with unfailing regularity, forcing through tempest and feeling through fog. The vessels of many other lines are doing the same thing in every part of the globe. We come to think that we have achieved the conquest of Nature and this catastrophe comes to show us that we are mistaken. It is sad that such a lesson is emphasized by the loss of women and children, and long absent colonists returning to spend the evening of their days in the old country. It is sad to see the gallant crew disappear into their watery grave and leave wives and little ones to the generosity of the public. We trust and feel that that generosity will make it assured that the grind of want shall not add to the sharp sorrows that these bereaved ones are feeling. We can send large sums of money for the relief of Eastern Christians. Here is an object, than which nothing can be more worthy, at our doors, nay, in our very midst. We cannot refrain from expressing our sorrow for the aged founder of the Castle Line, a man who all agree is one of the most liberal owners in the country, and one who takes care that nothing shall be wanting in ship, crew, or equipment to render safe the carriage of the lives entrusted to his charge. That the *Drummond Castle* was making for the course to the outside of Ushant everyone must be convinced. How she got inside we shall never fully know, for there is no one left who can tell anything of the courses set and steered. Whether any system of sub-division could have tended to the saving of life we cannot tell, but it is obvious that such a catastrophe as the present shows that bulkheads, to be reliable, must be without openings, and we say this in view of what passed at the recent meeting of the Institute of Naval Architects. We must assume that, as the openings were when the *Drummond Castle* struck, so they are now. There was no time to close anything that was open. The horror and sadness of this deplorable event is very much mitigated by the contemplation of some of the circumstances that attended it. We cannot do better than think of the Captain on the bridge quietly telling the passengers to be calm, and the obedience which his orders met, not only from the disciplined crew, but from the general body of passengers. The name of Chief Engineer Eyre is one to be emblazoned on the doors of the Castle Line and on those of the Institute of Marine Engineers. Something was wrong with the ship. Something was very wrong. So he went below to his engines and certain death. It is so simple, and so magnificent. And people say that we are a degenerating nation. Lastly, we have the kindly services of the Breton peasants of those sea-beaten islands, peasants who are tending our dead as though they were their own. The sea knows no nationality, and the Breton coast dwellers are wont to mourn their own loved ones slain as ours are, and there is a great bond of sympathy. We may be sure that this service wrought by these hardy fisher folk will do more to cement our friendship with our neighbours than a hundred congresses or a library of books on arbitration. And those who go down to the sea in ships, and those who prepare the vessels for their work have a lesson that the struggle is constant, and that no precaution is superfluous in dealing with the ever-watchful foe. There is room for invention and improvement still.

THE Institute of Marine Engineers have once more given evidence of their vitality and of the high estimation in which they are held by all, by celebrating their sixth annual function, in which Englishmen are said to delight, viz., an anniversary dinner on June 17th, in the King's Hall of the Holborn Restaurant. Their President, Sir Edwyn Dawes, K.C.M.G., was ably supported by a full table of visitors, including Vice-Admiral Sir George Nares, K.C.B., and Vice-Admiral Field, M.P., Sir James Mackay, Attachés from the Austro-Hungarian, Spanish and Russian Navies, Naval captains, and members of the Church, of Lloyd's, of the Board of Trade, and members of the Institute in fair numbers. The President, in submitting the toast of the Army, Navy, and Reserve forces, pointed out the particular interest of the toast to the company, inasmuch as the steady improvement in weapons of offence and defence of the Navy depended so much on the efforts of marine engineers and naval architects, and of the former a considerable number themselves formed a not unimportant part of the Naval Reserve, and wanted only the opportunity, so much craved for, of a yearly training in commission of the mighty engines of all sorts with which our naval monsters are so replete. Vice-Admiral Nares, in responding, reminded the meeting that this was the jubilee of the test tug-of-war between the *Rattler*, fitted with the then untried screw, and the paddle-steamer *Polyphemus*, which were lashed stern to stern to test in a very practical way which was the stronger; victory, of course, declaring itself in favour of the screw. He considered that though the character of the ships and boats had so vastly changed, the man-of-war's men were still of the same reliable type. In reply to the toast of the Houses of Parliament, proposed by Mr. James Laing, Mr. Ellison Macartney, M.P., stated that he cordially admired the manner in which the Upper House transacted business, and wished the Lower House could imitate their equanimity. He referred with regret to the loss of the breezy eloquence of Lord Charles Beresford, and hoped in the near future to hear him again. He spoke warmly of the valuable contributions to debate given by Admiral Field and Mr. Allan, in the House, and he thought there was general unanimity as to the necessity for maintaining in the highest possible degree of efficiency of the Navy, and that the subject was now exempt from the influences of party predilections. He trusted that the Admiralty, in spite of conflicting views amongst experts as to the value of their neighbour's inventions, would always be ready to take advantage of the ingenuity of the marine engineer. Vice-Admiral Field, in submitting the toast of our ships, colonies, and commerce, humorously commented upon the far-reaching character of the subject, and presumed he had been chosen to submit the toast because he had no connection with ships, knew nothing of commerce, and because he was supposed not to, but did know, something about the colonies. He spoke feelingly of the terrible disaster, only then just reported, of the *Drummond Castle*, and reminded the company that they were excellently represented in Parliament by those who were in no way backward in expressing their opinions, and seemed to think that engineers could not only drive their engines, but the whole Navy into the bargain. He himself had been told by a marine engineer in the House that admirals and captains were played out, and only fit to swab the decks; but suggested that it would be in better taste for all branches to use the pronoun "we," instead of "I," and work together as true partners. As to shipping, he had learned that the tonnage of British shipping was more than half that of the whole world, and that over 600,000 vessels left and entered British ports every year. As to the Colonies, he had heard a great deal of Imperial and Colonial, and commercial federation, which, however, could not be accomplished at once, but he hoped in time to see all these ambitions accomplished. Sir James Mackay, in responding on behalf of the Colonies, considered that marine engineering, our dependencies, our ships and our commerce, were indissolubly united. Marine engineers have done much to secure prompt communication with our Colonies, and have secured them to us, whilst in their turn the Colonies have developed commerce and called forth our ships. Sixty-five years back the British Steam Mercantile Marine numbered 298 vessels, with perhaps 900 marine engineers afloat, whilst now it consists of 8,386 steamers, with probably 35,000 engineers afloat. The increase of tonnage and economical machinery have enabled colonial and foreign produce to be transported to our doors at a less cost than they can be conveyed by land for a hundredth part of the distance, and this has changed completely the economic conditions of our country. Though engines are completely transplanting sails and masts, it is still a distant day when navigation will be done in the engine-room and steamers worked on the starting platform. Lieut. Col. Denny proposed the toast of the evening, the Institute of Marine Engineers, and referred feelingly to the deep interest taken by his late father in the Institute, and also of the danger bravely faced by the engineering staff on our ships of war, steadfast to their duty within locked doors, out of God's light, whatever disaster might befall the vessel. Mr. Adamson, in reply to the toast, impressed the duty upon engineers to constantly march onward with improvements, and stated that we might boast, as a nation, that we had helped to engine the navies of the world. The proceedings terminated with toasts to the visitors and kindred Institutions, and the health of the President, who, in reply, complimented the sturdy growth and self-efficiency of the Institute and the favourable regard in which marine engineers were generally held by those who knew them.

THE relations between the German Empire and Great Britain are now of the most cordial description. The Institution of Naval Architects have been the ambassadors of amity and good-will, and the German Empire by its representatives, the Ober Bürgermeisters of the municipalities of Hamburg and Berlin, the German Emperor himself in person, and all those interested in Marine Engineering, shipbuilding and cognate industries, have by their magnificent and hearty reception of the leading Institute of our shipping industries ratified the friendly compact of good-fellowship. The visit of the Institute of Naval Architects to Hamburg, Berlin and Stettin, has been an unqualified success, due no doubt to the directing master mind of the German Emperor himself, who took a keen and personal interest in the more than adequate entertainment of the visitors he evidently delighted to honour, and to the energetic carrying out of his intentions by the reception committees, and notably amongst these gentlemen, by the courteous, assiduity and attention of Herr C. Ferd Laeisz, Chairman of the Chamber of Commerce, of Hamburg, A.I.N.A., who met the members of the Institute on the *Fürst Bismarck*, which had been especially sent for them by the Hamburg-American Company, whose manager, Herr John Meyer, met the guests at Hamburg; and thereafter in Berlin, by His Excellency Admiral Hollmann, Imperial Secretary of State for the Navy, and Herr Dietrich, Constructor-in-Chief of the Imperial Navy, though all members of the large reception committees of Hamburg and Berlin vied with one another in their care for the comfort, entertainment, and honourable reception of the visitors. After a very quiet and pleasant passage across the North Sea, Lord Hopetoun, the President, and company were met by a special river steamer, and the reception committee of Hamburg, and after settling their hotels and luncheon they were conducted by steamer around the docks and works of Messrs. Blohm & Voss, who were themselves members of the reception committee and members of the Institute, and in order that the visitors should not want for entertainment after the serious business of the day, they were embarked on special steamers to make the tour of the Alster Lakes, where they enjoyed an open air concert at the Uhlenhorst Garden, and wound up a most enjoyable day by a supper and concert in the lower part of the new Rathhaus, given by the Senate of the City of Hamburg. Next day business was resumed at an early hour by papers being read in the theatre of the Concert-haus, to which the visitors were conducted by 140 private carriages, which remained at their disposal all the day and evening, conducting them after the meeting to a luncheon at the charming Fahrhaus, on the Elbe, and afterwards from the St. Pauli landing stage by a special steamer, supplied by Mesrs. Blohm & Voss, to an invitation dinner at Blankenese on the Elbe. On the return the banks of the river were illuminated by the residents, and boats and launches brilliantly illuminated were in attendance like a Richmond fête, thus terminating with a gala-like scene the second busy day in Hamburg. On the Wednesday, June 10th, the company departed by a special train on the State Railways, and after a suitable interval for settling themselves at their hotels, attended by invitation an entertainment at the New Royal Opera House, Berlin, with a supper at 9.30 p.m. in the adjoining saloons and front garden terrace. On the following day business was again resumed, by papers being read at the Technical High School, where the students, in their varied and picturesque uniform, formed as it were, a guard of honour. The Institution was here formally received by the President and members of the Berlin reception committee, and the reading of the papers was personally attended by the Emperor, who accorded the members the unprecedented honour of attending in the uniform of a British admiral, and evinced much interest in and approval of what he heard, and was accorded a most hearty and enthusiastic greeting by the members, who were much gratified by the personal interest shown them by the Emperor. The afternoon was devoted to the sights of Berlin, and visits to various works open to the visitors, the evening being devoted to the dinner of the Institution, which returned on this occasion the great courtesy and hospitality of the reception committees of Berlin and Hamburg. On Friday, after an open morning, came the great official fête of the meeting, viz., a reception by the Emperor himself, at the New Palace, Potsdam, court carriages being provided for the visitors, who arrived at the private station belonging to the palace. The reception was most cordial by the Emperor and Empress in person, who were personally introduced to many members of the Institute, and the former partook of supper with the company, and took a final farewell of them at the station upon their departure. Saturday morning was again occupied by business in the reading of further papers in the amphitheatre of the building for Chemical Industry, pleasantly closed by an invitation luncheon in the Exhibition Park, near the lake under the great Water Tower, given by the representatives of Berlin Commerce and Industry. On Monday, June 15th, this most interesting and successful visit was terminated by a trip to the Vulcan Company at Stettin, who provided an excellent luncheon. The visitors saw three large steamers for the German Lloyd Co., and two cruisers in the stocks, and the excellent organisation, method, and cleanly appearance of the works and workmen was very noticeable, and in contrast to the grimy condition of both, so generally seen in our large works. In conclusion, the thanks of all members and guests must be accorded to the courteous and able secretary of the Institution, Mr. George Holmes, for his able organisation of the visit, and his earnest courtesy and attention to all.

Gunboats for the Nile.—On Monday, June 22nd, Messrs. Forrestt & Son, Limited, of Wivenhoe, despatched the first of some stern-wheel gunboats which they are building for the Egyptian Government. The gunboats are intended to assist the troops engaged in the present Soudan expedition.

French Naval Attache.—Captain Richard has been appointed French naval attaché in place of the late Captain le Clerc, and the naval and dockyard authorities have been instructed to afford him the same facilities as were given to his predecessor.

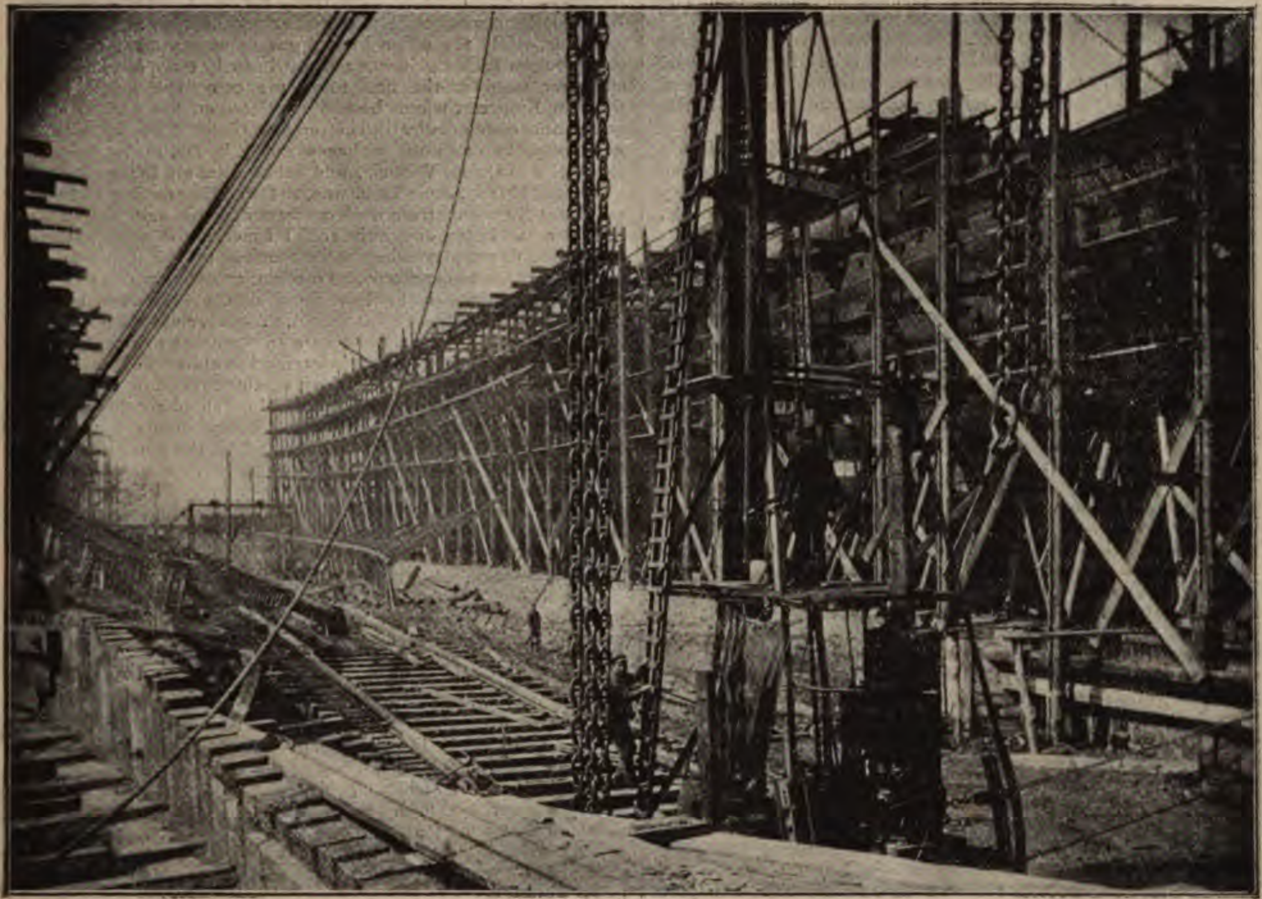


Engineering and Erecting Shop of Messrs. Blohm & Voss, Hamburg.

THE SUMMER MEETING OF THE INSTITUTION OF NAVAL ARCHITECTS IN GERMANY.

THE summer meeting for 1896 of the Institution of Naval Architects will long be remembered by all who took part in it, not only for its long and comprehensive programme but also, and chiefly, for the extreme courtesy, tact, and thoroughly business-like methods displayed by each and all of our foreign hosts.

Commencing with the departure of the members from London on Saturday, June 6th, by the s.s. *Furst Bismarck*, most kindly placed at the disposal of the Institute by the directors of the Hamburg-American Line, and which vessel, together with saloons, dining and music rooms, &c., we have pleasure in herewith illustrating, the meeting did not terminate until Monday, June 15th, Berlin being the centre from which the members dispersed.



Laying the Keel of a Mail Steamer, Vulcan Works, Bredow, Stettin.

Before commencing with what may be termed the business part of the programme, we should indeed be lacking in courtesy if we did not note with gratitude the spontaneous feelings of kindly interest evinced by all with whom the members were brought in contact during their sojourn abroad, a feeling which we have no hesitation in saying was fully reciprocated by the visitors.

Amongst those attending we noticed Sir Wm. White, Sir E. J. Reed, Sir Raylton Dixon, Lord Charles Beresford, Sir N. Barnaby, Sir Bernhard Samuelson, Capt. S. Eardley Wilmott, Admiral Fitzgerald, Admiral Rowley, Admiral Bowden-Smith, Mr. A. Denny, Mr. Martell, Mr. J. T. Milton, Mr. A. E. Seaton, Mr. G. W. Manuel, Mr. St. Clare J. Byrne, and other distinguished visitors.

To return to the programme, the *Furst Bismarck*, favoured by the finest of weather and smoothest of seas, made a splendid passage, steaming as far up the Elbe as Brunshausen, where she dropped anchor late on Sunday night, and after a meeting of the Council in the music saloon on the promenade deck, which we illustrate, and breakfasting on board, the nearly 400 passengers, including many ladies, were taken off by the tender and conveyed up the river to Hamburg, the St. Pauli landing stage being reached about midday.

At 2.30 p.m. a tour of inspection was made round the harbour of Hamburg in three special steamers, and a visit paid to the works of Messrs. Blohm & Voss, of which more anon. At 8 in the evening the visitors embarked on special steamers for a tour on the Alster Lakes, and at 10 p.m. the members were received by the Mayor and Senators in the new Rathhaus, the reception being followed by music and supper.

On Tuesday, June 9th, the Institution met at Ludwig's Concert House for the reading and discussion of papers. The Mayor, Dr. Monckeberg, welcomed the members in a speech in German, in which he gave an historical review of the relation of Hamburg to England, and at the conclusion of his speech expressed his pleasure at the fact that the Institute had directed its steps to Hamburg. The Mayor's speech was then read in English by the Secretary (Mr. George Holmes), and heartily cheered. The President, the Earl of Hopetoun, speaking in reply, particularly emphasized the fact that the Institute might be described as an International rather than a purely English society, and concluded by expressing his hearty thanks for the kind reception accorded them in Hamburg. His lordship having taken the chair, the following papers were then read and discussed:—

"The Maritime Position and Principal Features of the Port of Hamburg," by Herr F. A. Meyer, Engineer-in-Chief of the City of Hamburg. This paper was read by the Secretary, Herr Meyer, indicating on numerous charts the positions referred to. As it was of purely local interest we do not purpose reproducing this paper or the discussion on it. "Shipbuilding in Germany," by Herr C. F. Laeisz, chairman of the Hamburg Chamber of Commerce. "Recent Improvements in Ship-docking Appliances," by Lyonel Clark, Esq. The last paper was taken as read, and therefore no discussion took place on it.

The members were afterwards driven round the principal parts of the town, and set down at the Fahrhaus, where luncheon was served, after which the guests were driven round the Alster Basin and back to their hotels. Shortly after 6 the visitors left by Ballin's steamer *Prinzessin Heinrich* (a new boat built by Messrs. Blohm & Voss) for Blankenese, where a dinner was given by the citizens and ladies of Hamburg. Brilliant displays of fireworks were made along the banks of the Elbe, and large numbers of people were in boats viewing the spectacle. The party broke up about ten and returned by the same steamer.

On Wednesday, at 9.45 a.m., the Institute bade a reluctant farewell to its kind friends at Hamburg and left in two special trains for Berlin, reaching the Lehrter railway station about 2 p.m., where they were received by some members of the Berlin reception committee.

The official reception took place at the New Royal Opera House, where the members, in response to an invitation from the Imperial German Government, attended at 7.30 p.m. The party was met in the "Roman" Hall by the reception committee, headed by Vice-Admiral von Hollman, with whom were Herr Zelle, chief Mayor of Berlin, and Dr. Bosse, Von Berlepsch, Von der Recke, and Herr Schoenstedt, Ministers of State; Count Von Posadowsky, Secretary of State, Count von Wedel, Minister of the Royal Household; Von Buol, President of the Reichstag, a number of the leading members of the Reichstag, and Herr Goldberger, Counsellor of Commerce, as representative of the Exhibition Committee, and in addition a number of German and English Naval officers and many ladies. The formal reception was followed at 8 p.m. by a "gala" performance, consisting of the second act of "Tannhauser," and a ballet. The programme was printed in English. After the performance supper was served in various rooms and on the terrace, covers being laid for about 1,000, the band of the 2nd Guard's Regiment performing during the repast.

The first meeting in Berlin was held June 11th, in the large hall of the Technical Academy. The Senate headed by the Rector, Professor Muller, Breslau, and surrounded by the students, received the committee of the Institute, headed by the Earl of Hopetoun, at 9.45. Professor Muller, Breslau, having delivered an address, which was replied to by the President, the proceedings were shortly afterwards graced by the presence of His Majesty the Emperor, who arrived soon after ten, dressed in the full uniform of an English Admiral. After a short welcome from the Rector, the Emperor at once turned to the Earl of Hopetoun, whom he greeted in English, and with a hearty handclasp, His Majesty afterwards leading the procession into the large Hall, where on arrival the Emperor welcomed the members. The President having given the signal for the proceedings to commence, Admiral Hollmahn, Imperial Minister of Marine, delivered an inaugural speech, concluding with words to the effect that the members would see, from the presence of their distinguished honorary member, the German Emperor, what great importance was attached to the labours of the Institute, and expressed a wish that this year's meeting on German soil would have the same fruitful results as had hitherto distinguished all their undertakings. The speech, which was made in German, was repeated by Mr. Holmes in English, and was received with long-continued applause. An equally stormy ovation greeted, later on, in the course of a discussion, a speech by Sir Wm. White, in which, *inter alia*, he congratulated the Emperor on the victories of his new yacht *Meteor*, protracted cheering showing that the representatives of English shipbuilding were far from begrudging the Emperor his victory. His Majesty rose from his place and bowed by way of acknowledgment.

The Earl of Hopetoun, in his reply to Admiral Hollman thanked the Emperor for his appearance, and the Government and reception committee, and said they were proud to number His Majesty among their honorary members, as they esteemed him as one who entered with full knowledge into all branches of naval science. After this official act of welcome the business part of the meeting commenced, and the two following papers were read and discussed:—"Development in the Design and Construction of German Men-of-War," by Herr A. Dietrich, Constructor-in-Chief of the German Navy; "The Classification and Relative Power of Warships," by F. Elgar, Esq., LL.D., F.R.S.E.

A third paper, by Herr Schlick, was down for reading this day, but when, after one o'clock, the agenda of the meeting had not been fully gone through, and the Emperor rose to take leave, the chairman closed the meeting, and with the other gentlemen of the committee accompanied the Emperor to the main entrance, where he took leave from all in the most affable manner.

The meeting then adjourned for the day, the dinner of the Institute taking place at 7 p.m., in the Grand Hall of the Kaiserhof Hotel. Lord Hopetoun was in the chair, and was supported by Dr. Bosse, Minister for Education, on his right, and by Mr. Gosselin, of the British Embassy, on his left. Admiral Hollman, Lord Charles Beresford, Sir E. J. Reed, Sir Wm. White, being seated, with many other notabilities, at the principal table, while the other invited guests were accommodated at twelve cross tables. It was not until nearly ten o'clock that the chairman rose for the first toast, proposing the health of the German Emperor, whom he congratulated on the victory of his yacht, and concluded with the remark that "Emperor William will always be our most welcome guest." Dr. Bosse proposed the health of Queen Victoria, and other speakers followed.

Though Friday, June 12th, was, so far as the reading of papers and other formal matters were concerned, a *dies non*, it will ever remain a red letter day in the social functions of the Institute, for on that day the members were received by the Emperor and Empress in the new palace at Potsdam, an event which was certainly one of the most brilliant items of the entire programme. The guests were conveyed at 6.40 p.m. by special trains to Wodpark Station, where carriages were in readiness to convey them to the palace. The Emperor, wearing the uniform of an admiral of the British Fleet, and the Empress, surrounded by their suite, received their guests in the brightly illuminated reception rooms on the ground floor of the palace. Refreshments were afterwards served in the Jasper Gallery and in the Shell Room, and their Majesties entered into conversation with a number of the guests, the Emperor conversing particularly with the Earl of Hopetoun, Sir Wm. White, and other eminent members of the Institute. After spending about an hour and a half in the Palace, the whole party adjourned to the terrace to view a torchlight procession and military tattoo ordered by the Emperor.

Several hundred soldiers, each bearing a magnesium torch, marched up the avenue, the music being supplied by eight military bands massed as one. For about an hour they performed together, British airs alternating with German music, the performance concluding with the "Prayer Tattoo," which was sounded at 10 o'clock. Before the last of the men had filed off the guests were already being driven to the station, where a special train stood in waiting to convey them back. The Emperor had followed them, and as the train steamed slowly out of the station he stood on the platform in a posture of military salute, a parting compliment which caused hats and handkerchiefs to be waved from all the carriage windows, accompanied by enthusiastic acclamations, and so closed a day ever to be remembered with pleasure by those privileged to participate in it.

Saturday again saw the members astir early, as they were timed to leave the Tannowitz Bridge at 9.30 on a visit to the exhibition, where the representatives of Berlin commerce and manufactures had prepared a brilliant reception for them. Two special steamers, tastefully decorated with the German and British colours, conveyed the guests, who were specially honoured by the steamers being permitted to land their passengers at the "Emperor's Pier," which had not been used since the opening day, when the Emperor landed there. Here the members were received by the whole Reception Committee, and led to the auditorium of the Chemistry Section, richly decorated for the occasion. Mr. Herz, Privy Councillor, and chairman of the "College of Elders" of the Berlin Mercantile Community, welcomed the visitors in a speech, in which he said that the representatives of commerce and industry could not refrain from paying a special mark of respect to the Institution of Naval Architects on their visit to Berlin, adding that they gratefully acknowledged the benefits which the progress in navigation conferred on every branch of international traffic, and they fully recognised the endeavours of the Institution to promote progress in matters of navigation and naval construction. The address having been repeated in English, elicited the applause of those present. The Earl of Hopetoun replied, with hearty words of thanks, for the splendid reception prepared for the members, and having read the Emperor's reply to a telegram of homage which had been sent on the occasion of the Institute dinner, the business part of the meeting commenced, and the following papers were read and discussed.

"On Signs of Weakness in Tank Steamers," by Herr Otto Schlick. The reading of this paper was held over from Thursday. "On Various Descriptions of Doors applicable to Water-tight Bulkheads, their Fastenings, &c.," by B. Martell, Esq. "The Employment of Electricity on Board Ships," by Herr F. Eickenradt.

After the close of the discussion the President once more expressed, in feeling and cordial terms, their great indebtedness and most sincere thanks for the grand reception they had received in Berlin, adding that he was fully convinced that no foreign body had anywhere ever met with such a splendid reception as they had. The noble Chairman said that he was sure that he could not better conclude the present meeting than by expressing the hope that the Institution of Naval Architects would be honoured with an opportunity of returning the kindness they had received by being allowed to show similar hospitality to their German professional colleagues when they arrived on English soil. He finally called upon those present to rise in their places in honour of the Reception Committee, whereupon there spontaneously burst forth a threefold "hip-hip-hurrah" in honour of the Committee. Admiral Hollman, on behalf of the Reception Committee, expressed his satisfaction at the very pleasant manner in which the whole of the festivities had passed off, and joined in the hope that Germans might soon have an opportunity of fraternising in an equally festive manner with the English. The meeting then broke up, and those assembled then adjourned to the principal restaurant in the Exhibition Park, where, on the invitation of the Committee, over 500 persons sat down to lunch, Mr. Herz, who occupied the seat of honour next to Lord Hopetoun, proposing the healths of the Queen of England and the German Emperor, and these having been suitably honoured, the company dispersed.

On the last day of their stay in Berlin, Monday, June 15th, the members were conveyed by special train to Stettin, for the purpose of inspecting the shipyards of the Vulcan Co., which were in full activity. After spending an hour and a half in going over the works and yards, the members returned by steamer to Stettin, where luncheon was provided, and after partaking of this the return to Berlin was made by special train, and the summer meeting of 1896 concluded.

We cannot close this brief account without expressing, on behalf of the Press and the visitors, our sincere thanks to all concerned for the excellent arrangements made to ensure the comfort and enhance the pleasure of all attending this meeting, and in this connection we would specially mention the names of the Hamburg-American Line, who were our hosts while on board the *Furst Bismarck*; to Herr F. A. Meyer, Chief Engineer of the City of Hamburg; to Admiral Hollman and Dr. Von Botticher, of Berlin; to all the members of the Reception Committee, and to the courteous Secretary (Mr. George Holmes), to whose indefatigable exertions so much of the success of the meeting was due.

Owing to pressure on our space we are compelled to hold over our report of the Papers read and the discussions thereon until our next issue.

Foundry and Clock Tower, Vulcan Works, Bredow, Stettin.

It has been mentioned that the members visited the yards of Messrs. Blohm & Voss on June 8th, and the following brief account of their establishment, and accompanying view of the works and fitting shops, will be of interest, and for which we are indebted to the courtesy of the firm. The yard is situated on the Elbe at the entrance of the Schanzengraben, and has an area of over twenty-five acres. Founded originally on a modest basis, it is now, after having been in course of time considerably extended, in a position to build the largest vessels both for the Government and the merchant navy. The ground necessary has been recovered by dredging 500,000 cubic metres of sand from out the Elbe, so that the depth of water in front of the shipyard now permits the largest vessels to lay direct alongside the quay. The quays have a frontage of 550 metres on the Elbe and of 240 metres on the Schanzengraben.

Directly opposite the shipyard are situated the two floating docks, constructed of iron and consisting of six sections, each dock capable of lifting ships of a length of more than a hundred metres. A third much larger dock, capable of lifting vessels up to 17,500 tons displacement, is now in course of construction.

The large new buildings are entirely constructed of iron and brick. At the entrance of the shipyard are the main offices, the offices of the shipbuilding and marine engineering departments, and a large model-room, in which the models of vessels built by the firm are exhibited.

At the east of the dockyard is the shipbuilding establishment, of an area of 5,500 square metres, containing the furnaces, bending blocks, rolling, bevelling, punching, shearing and planing machines, as well as hydraulic rivetting machines.

In front of these works are the seven berths for the construction of ships up to 170 metres and more long. Next to these berths are the sheds of the angle-smiths, lock-smiths, copper-smiths and tinners.

Opposite to the entrance of the yard are the engine works, fitted with the latest and most modern machinery for the building of engines up to the largest sizes. Here you find large planing and cylinder boring machines, lathes, cranes, &c., moreover three engines of 150 H.P. each for driving the different lines of shaftings, as well as the dynamos for the six electric travelling cranes, capable of lifting from ten to thirty tons each.

The boiler works are also fitted with a full complement of special machinery and hydraulic tools for bending and flanging plates for boilers up to the largest sizes and highest pressures. Here are also a number of turning cranes as well as three travelling cranes of a capacity of thirty tons each, driven partly hydraulically, partly by electricity.

The smithy is of large size and containing sixty hearths, etc., as well as different steam-hammers of various size.

The joinery works is a large building three stories high, entirely built of iron and brick, and fitted with special machinery, such as moulding, planing, dove-tailing, boring and milling machines, band and circular saws. Next to the joinery works is the saw mill, with large rack and band saws and planing machines, and adjoining to this the carpenters' shop.

On the quays are the necessary cranes for lifting the material and placing on board the engines and boilers. There is a large shearleg crane of a capacity of 100 tons and a height of 28 metres, two stationary cranes of 20 tons each, one derrick crane of 10 tons, and three travelling cranes. A second very large derrick crane of 150 tons capacity at a radius of 20 metres, 45 tons at 32 metres radius, and a height of 45 metres above ground, is in course of construction.

Three tank locomotives and more than 100 trucks are employed in transporting material, and a complete telephone system connects all departments.

The number of workmen employed averages more than 3,000.

The number of ships built and building in the yard since 1878 up to the present time is 121, including some 24 sailing vessels, all of which have a very good record for fast sailing.

At present one steamer for the Hamburg-South American Steam Navigation Co., of about 6,500 tons deadweight, is building; also two steamers for the Deutsche Dampfschiffs-Rhederei zu Hamburg, of 7,000 tons each; moreover, two twin-screw steamers for the North German Lloyd, Bremen, viz., one passenger and freight steamer of a length of 525 ft., and 10,000 tons deadweight and one of 4,000 tons.

Besides, the shipyard has just delivered for the Hamburg Heligoland passenger service a light draught saloon paddle steamer, with a speed of 16 knots. Finally, there is approaching completion a twin-screw passenger steamer of a length of 400 ft. and 6,000 tons deadweight, built to the order of the Deutsche Ost-Afrika-Linie, Hamburg.

Messrs. Yulcan Co., Bredow, Stettin.

Another establishment, the inspection of which afforded deep interest to the visitors, was the yard and works of the Vulcan Co., of Stettin, a general view of which is given in our two-page supplement, and smaller views showing the laying of a keel of a mail steamer; exterior of the foundry, with clock tower, interior of the foundry; two views of the damaged Brazilian ironclad *24 de Mayo*, in floating dock; also an illustration of some very large engines for use in the 20,000 ton ship referred to later on. Of the six small views, Fig. 1 is a view taken in the locomotive erecting shop; Fig. 2 is from a view taken in the main erecting shop; Fig. 3 shows a marine engine being erected; Fig. 4 is taken in the locomotive erecting shop; Fig. 5 is a view taken in one of the large turning shops; while Fig. 6 is from a view taken in the heavy erecting shop. We have to thank the proprietors for these photographs, and trust that they will convey to our readers a better idea of the magnitude of these works than any mere description would do.

The company was formed in 1857. The origin of the works dates back to 1851, in which year Messrs. Fruchtenicht & Brook established a small yard for building iron ships, and engineering work on a small scale, on the present site. The original establishment had only one-fifth of the present extent, the present establishment covering 25 hectares (62 acres). On the formation of the company, in addition to shipbuilding the construction of locomotives was at the same time taken in hand, and in the spring of 1859 the first locomotive engine was delivered. In 1866 the first man-of-war, of small size, was taken in hand, and in 1869 the first large-size marine engine was built for the ironclad frigate *Hansa*. The first order for a large-sized ironclad, the *Preussen*, was given to the Vulcan Co. by the German Admiralty in 1869. Up to the present 235 vessels and over 1,500 locomotives have been built by the Vulcan Co. for home and abroad, among which, besides various small-sized men-of-war and merchantmen, 17 large men-of-war for the German Navy, namely, the armoured sloop-of-war *Preussen*, the cruisers *Leipzig* and *Prince Adalbert*, the armoured sloops-of-war *Sachsen* and *Wurttemberg*, the cruisers *Stosch*, *Stein*, *Carola* and *Olga*, the armoured sloop-of-war *Oldenburg*, the cruiser *Irene*, the battleships *Brandenburg* and *Weissenburg*, the yacht *Hohenzollern*, the despatch-boat *Comet*, the cruisers *K* and *N*; further, six large-sized men-of-war for the Chinese Navy, viz., the armoured sloops-of-war *Ting-Yuen*, *Chen-Yuen*, *Lai-Yuen*, *King-Yuen* the torpedo catcher *Fei-Ying* and 10 torpedo-boats for the German Navy, six for the Greek, and two for the Russian Navy. Among the many vessels built for the Mercantile Navy there are a number of the largest and fast freight steamers for Transatlantic traffic, viz., for the North-German Lloyd fast-liners *Kaiser Wilhelm II.*, *Havel*, *Spree*, *Preussen*, *Baiern* and *Sachsen*; for the Hamburg-American Steam Packet Co.: fast liners *Augusta*, *Victoria*, *Furst Bismarck*, the freight steamers *Patria*, *Palatia*, *Dania*, *Scandia* and *Rugia*.

There are at present on the stocks, one twin-screw fast liner 625 ft. long, 66 ft. beam, and to steam 23 knots, of 20,000 tons displacement, and 28,000 I.H.P.; two twin-screw freight and passenger steamers, each 523 long of 17,600 tons displacement and 7,000 I.H.P., to steam 14 knots. Two cruisers for the German Navy, of 5,600 tons displacement. With the exception of rolled iron goods and of heavy shafts and other forged pieces, all parts of both vessel and machinery are produced in the company's own works.

The average number of men employed is 4,500.

The Furst Bismarck.

As a very full description of this vessel appeared in our issues for June and July, 1891, we need not here say any more than that she is a very finely-proportioned vessel, as will be seen from the large view, while the smaller views bear testimony to the handsome and luxurious manner in which her interior fittings have been carried out, while we can speak from personal experience as to her comfortable and good sea-going qualities.

The thanks of all who took passage in her are due to both officers and crew for the kind and courteous consideration shown by them to all their passengers, and not the least pleasant item in the programme was the short sojourn in this splendid ship.

THE "BAIRD-THOMPSON" AIR PROPELLERS.

WE have recently received from the "Grahtryx" Ventilating Co., Limited, of the Charlton Engineering Works, Charlton Place, London, N., particulars of their system of ventilation by means of the "Baird-Thompson" air propellers, several typical forms of which we herewith illustrate.

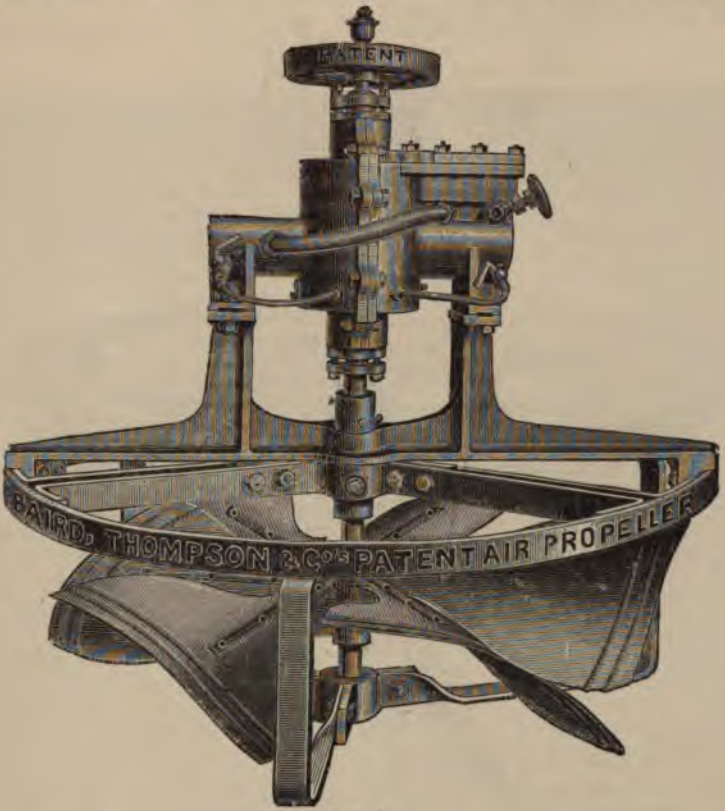

PATENT
BAIRD, THOMPSON & Co's PATENT AIR PROPELLER

Fig. 1.

It is generally known that one of the chief causes of the loss of efficiency with regard to mechanical ventilation when air propellers are used is due to the fact that volume fans have been incapable of working up to a sufficient pressure to overcome the friction consequent upon long air mains and changes of direction, while on the other hand a pressure blower does not deliver a sufficient volume of air to make it adaptable to ventilation, and further, the expenditure of power for a blower is excessive and out of all proportion to the results obtained.

To overcome these defects the "Baird-Thompson" propeller has been designed to combine the two principles, and thus, while it delivers a greater volume of air than any other propeller, the pressure can be regulated in proportion to, and so as to overcome the resistance in, any length or form of air main, and that within the moderate limits of speed consistent with economical working.

In the accompanying illustrations Fig. 1 shows a combined Baird-Thompson patent high-speed engine and their air propeller. These engines—Fig. 2 shows a modified and less powerful form for driving the smaller sized propellers—have been designed with a view of attaining the highest possible efficiency in the smallest space and with the least weight, and are made simple or compound, condensing or non-condensing, and will work with all pressures up to 250 lbs. per square inch. They are perfectly balanced and run absolutely steady, and noiselessly.

The makers having put down special tools and appliances for the manufacture of these engines, are able to guarantee them both as regards workmanship and materials.

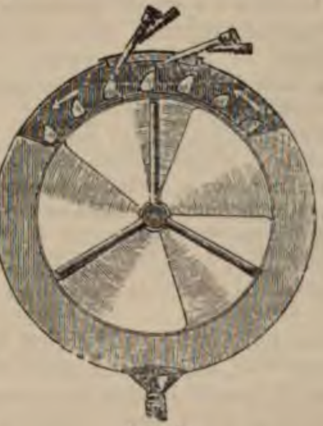


Fig. 4.

Now that nearly every ship is provided with electric lighting plant the addition to her equipment of the

Baird-Thompson electric air propeller, as shown in Fig. 3 of the accompanying illustrations, cannot but prove a desirable and useful acquisition. Here, as will be seen, the driving power is supplied by the electric motor, which may be wound to suit any current supplied by the generating dynamo, and will, of course, work in any position. It scarcely need be said that it is much easier to convey power by electric current in a couple of wires than to convey the same amount of power by steam pipes or gearing, and wherever dynamos or electric mains are fixed, this form of driving should specially commend itself, a 12-in. propeller, when delivering 1,000 cubic feet per minute, costing barely a farthing an hour for current. We may here say that one of these electric fans (large size) has been working most satisfactorily at the Birmingham new Technical Schools for some time.

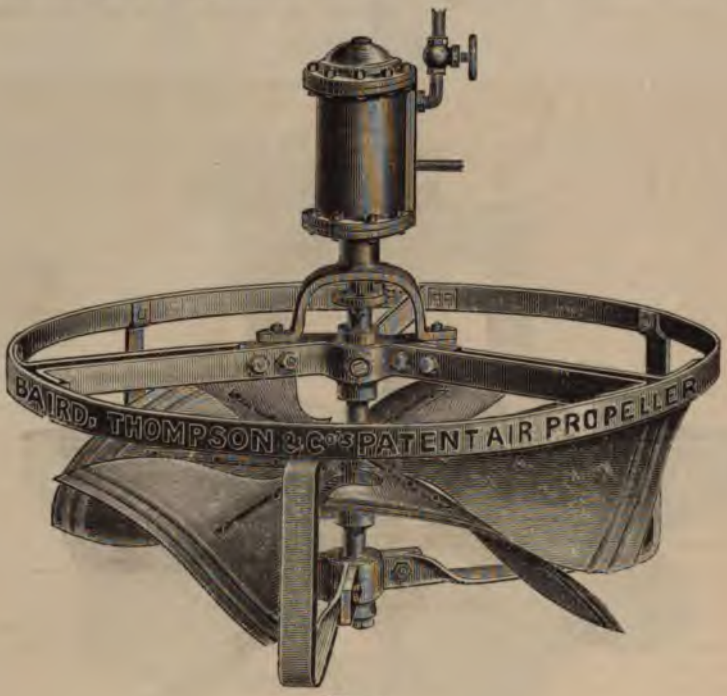

BAIRD, THOMPSON & Co's PATENT AIR PROPELLER

Fig. 2.

In Fig. 4 is shown a small water-motor arrangement for driving the propeller. Here the water, under a sufficient head or pressure, passes through the nozzles shown into the small buckets and so causes the rotation of the propeller.

It will give some idea of the range of size of these various motors and air propellers if we say that the company make them from 12 in., capable of delivering 1,000 cubic ft. per minute when absorbing 1-36 of a H.P., to 120 in., delivering 205,000 cubic feet per minute, and requiring 13 H.P. to drive it. Any of these sizes may be constructed for ordinary belt and pulley driving.

The company have, during the period 1887 to 1896, taken 25 gold medals, being the highest awards given for ventilating appliances during the years indicated, and so satisfactory have their different appliances proved after the severest tests that one of the principal Atlantic shipping firms has ordered the fitting up of their entire fleet with the complete system of automatic and mechanical ventilation originally introduced by Messrs. Baird, Thompson & Co., the well-known pioneers in the development of ventilation, warming, and drying, and whose methods have been very much improved of late years by their successors, the Grahtryx Ventilating Co.

After severe and prolonged practical tests, which in every instance appears to have given the highest satisfaction to all concerned, contracts have been

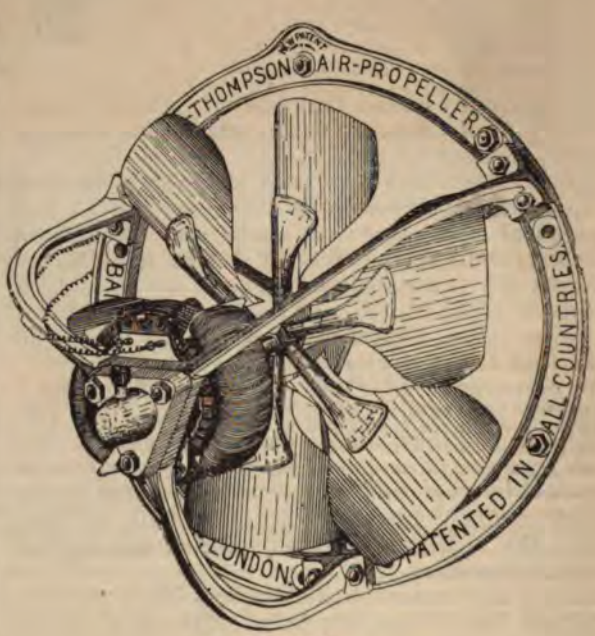


Fig. 3.

placed with the company for fitting their improved system of ship ventilation on vessels belonging to the Russian and Chinese Governments, as well as to vessels belonging to several of the leading large firms.

Those of our readers who attended the last annual conversazione of the Royal Institution may remember seeing one of these propellers on the table, where it attracted considerable attention from the large and distinguished company present.

FOUNDRY AT THE VULCAN WORKS, BREDOW, STETTIN.

THE FLEETS OF THE MAIL LINES.

(From our own Correspondent.)

The Great Disaster

Has dwarfed all other matters in connection with the Fleets of the Mail Lines. The vessels of these fleets run with the regularity and safety of express trains, and men come to forget the perils of the sea. Now and then such a disaster as that of the North German Lloyd liner *Elbe* last year—a disaster which still from time to time is brought forward in the Admiralty Court, and now this of the Castle liner, come to tell us that there are circumstances under which man is a helpless victim to the remorseless sea that in ordinary circumstances he so successfully and thoughtlessly rules. The loss of the *Drummond Castle* too has many points which accentuate the horror in a way that was lacking in the *Elbe* case. In the first place the people who were lost in the *Elbe* were outward bound and had bidden farewell to their friends and relatives with the feeling that, though Europe and America are comparatively near now-a-days, it would still be a long farewell: and for many of them, perhaps, the last. With the homeward bound passengers of the *Drummond Castle* there was the sadness that men who had attained an honourable ambition, and who would have seen the next morning's sun shining on the coasts of Britain, lost their lives almost on the threshold of home. Again, though the persons lost in the *Elbe* were subjects of a friendly, and even of a kindred nation, they were in fact not known to us. Here the lost are our own flesh and blood, and we cannot speak to the man in the street without finding that he has lost a friend, or it may be a relation.

So, too, there was something of the unexpected in the loss of the Cape boat which could hardly be found in the wreck of the *Elbe*. The North Sea in January is not a pleasant place. Perhaps it may be said that the neighbourhood of Ushant is never a nice place. The retort is a just one. But the passengers by the *Elbe* had to traverse rough seas at their worst to get to their desired haven. No one on board the *Drummond Castle* ever wanted to see the cruel rocks of Ushant. They did not want to go near them. Surely a June voyage from the Cape might have been relied on as one which could not be attended with much danger. And this remark brings us to the strange fact, which is all we shall ever get, that the *Drummond Castle* was miles to the east of the position that she ought to have had. That she was miles to the east of the place where her experienced skipper and his officers believed her to be in. The undisputed fact that she was going fourteen knots when she struck, proves conclusively that no one dreamt she was anywhere near the fatal rocks. And the irony of it all is that this evidence of the uselessness of human precaution took place whilst the Institution of Naval Architects were sitting in Hamburg, and whilst the echo of the revelries that celebrated Lord Kelvin's jubilee were yet fresh in our ears. The great scientist, who will ever be dearest to those that go down to the sea in ships, as Sir William Thompson, has done much for the safe navigation of the seas. The great diminution of strandings in proportion to the numbers of iron vessels now on the seas proves this effectually. Yet the terrible disaster which has occurred tells him, and those that travel in his footsteps, that there are still further worlds of scientific discovery to be conquered, and that our greatest men are still children playing on the shore of the unknown ocean of knowledge. In merely crossing the Bay of Biscay an experienced sailor, with presumably every resource that science can command to aid him, gets far out of his course, and apparently has no means of being made to suspect that he is wrong in his position, though the great French lights are pouring their warnings into the mist-bank, and the vessel is constantly using her lead. As for the Institution of Naval Architects, the discussion was hot as to the need for watertight doors in bulkheads, and as to the dangers their presence brings. The silent example of the *Drummond Castle* shows that there is no time, in some cases, to shut doors, and that if the bottom be ripped out bulkheads are no hindrance to the inrush of water. They did not even give time to get away the boats. So the naval architect has still room for experiment and for invention even in the peaceful merchant ship.

It is well for those who suffer by this visitation to see that sympathy with them is universal. The Castle Mail Packets Company deservedly has the reputation for the greatest care and for sending out the best found ships. In the course of the almost quarter of a century which this line has been running it has only now lost four ships, and the present is the first occasion on which one of these has had a result fatal to any passenger. The companies who have never lost a passenger's life are few indeed now. I almost doubt if any line—of the oldest standing—can now justify the boast. I have been looking through my notes of wrecks, and would imagine that there is no place in the world more fatal than Ushant and the Ile de Molene. It is not with the vessel that touches there a case of damage, however serious. It is an instant total loss, and the hapless voyager may be thankful if time be given him to get away in the ship's boats. "Foundered half an hour after striking"; "went down in seventeen minutes," these are the notes on many disasters here. It is just nineteen years since a mail steamer homeward bound, as was the *Drummond Castle*, from the Cape, struck in the same spot. Fortunately in her case there was no loss of life.

An Unfortunate Mishap

has temporarily defeated a very good scheme of our neighbours on the other side of the Channel. Great interest, as is well-known, is taken by the French in the fisheries off the coast of Newfoundland, where so large a fleet of vessels flying the tricolour is employed. It occurred to some charitable Frenchman that the hardships endured by the fishermen might be very much mitigated if a hospital ship were stationed in these waters for their benefit. The idea found acceptance with the public, and funds were found to carry out the notion. A very handsome vessel named the *Saint Pierre* was built for the purpose and fitted out by public subscription. She was rigged as a three-masted schooner, and unfortunately depended entirely upon her sail-power. Beside her captain she carried a medical officer and a chaplain, so that she could afford spiritual as well as physical comfort to the fishermen. It was only during the month of May that she commenced her duties and her first cruise was unfortunately her last. She encountered a very dense fog—such as is perhaps more the rule than the exception in the waters where her duty lay—and after three days she drifted ashore on the inhospitable coast, were she unfortunately became a total loss. She worked long enough to show her value, and the subscribers are not discouraged. Another *Saint Pierre* is to be built, and, perhaps, as the first vessel's fate seemed to show the inadvisabilty of depending on sails alone, the new vessel may have, at least, auxiliary steam.

The Reserve of Armed Cruisers.

In my last lot of Notes I spoke of the superiority, from a military point of view at least, of the Russian equivalent to our reserve of armed cruisers. I have now to point out how the French too have gone one better in adopting the British idea. They publish a list of the cruisers in the reserve. These include seven of the finest and largest of the vessels in the fleet of the Compagnie Generale Transatlantique, including all the New York mail boats and the pick of the West Indian Line. Besides these there are a dozen of the Messageries liners, including the vessels which first showed the world the capabilities of the Belleville boiler. So far they are working on British lines. But they have another squadron of auxiliary despatch vessels, taken from the fastest class of smaller mail boats, and these would, it is needless to say, be invaluable in their special province when the service of auxiliaries were required and a general moblization took place.

The Continental Service

had an experience at the end of May which may not be its again for a generation. The London, Chatham and Dover Railway Company has discarded three of its older vessels within a week. These vessels had braved the storms of the Straits of Dover for thirty-five, thirty-three, and thirty-three years respectively. They had certainly been marvellous good boats, and the fact that they held together so long reflects the utmost credit on the Thames shipbuilder, now practically an extinct race—as far as merchant ships are concerned, at least. None the less has the continuance of such vessels on the station been a great hindrance to the development of the company's own traffic, and a very serious annoyance to timid passengers who dreaded the chance that they might be put off with one of the "old tubs," as these once dashing little craft were wont to be styled. The *Daily Telegraph* ran to a column over an interview with a former commander of one of these vessels, who, of course, spoke most affectionately of his old charges. But the lesson must be learnt by railway companies that passengers have no gratitude and no sentiment. They want the best thing current at the lowest price, and if they don't get it in one place they will try somewhere else, without waiting to be told that thirty-five years ago the *Samphire* was the crack boat of her day. They might remark in reply that 1896 is not 1861, and that shipbuilders, engineers and harbour builders have progressed in that time, and why should they be content with what is admittedly thirty-five years behind the times.

The New Express Line to Canada

was mentioned in my last Notes. I remarked that the 10th of June was the day fixed for the sending in of tenders by proposing contractors. It has transpired that three tenders were sent in, but what they were and who sent them in has not yet been made public. But the fact encourages one to hope that the service may really soon become an accomplished fact.

A New Steamship Company

has been formed to carry on the business of Messrs. Jenkins & Co., the owners of the "Shire Line," or "Japan Line," as it is sometimes called. This step has been taken in consequence of the death of the late Mr. D. J. Jenkins, founder of the line. It has been currently reported that this line was founded in 1859. So it probably was with sailing ships. But as a steam line it is of much more recent development. Like so many other successful shipowners Mr. Jenkins started in sail. When the Suez Canal was opened, and the compound engine rendered the working of steamers much more economical than it had been heretofore, he, like others, saw that the conditions of things were rapidly changing, and like a wise man he prepared to take advantage of the new circumstances. Accordingly in the early seventies he made his first essay into steam. Events justified the step, and the steam fleet gradually pushed the sailing ships into the background.

An Engineer's Heroism.

In the MARINE ENGINEER of the 1st May, I spoke of the noble deed by which Captain Nutman, of the s.s. *Aidar*, obtained the Albert Medal of the First Class for saving the life of one of his firemen. In commenting on this gallant deed, I said "probably we shall not have to wait long to have a recurrence of one of those acts of bravery in the engine-room, where an engineer shuts off steam after an accident, or stays at his post in case of leakage, to see that the race for the palm is an even one where British seamen and British engineeers are concerned." We have not, indeed, had to wait long. The form of self-sacrifice was of the first of the two classes I suggested, and the more one considers the matter, the more one is filled with respect and admiration for the man who performed the deed. I have already referred to the loss of the *Drummond Castle* in its more general aspect. I now wish to speak of the conduct of her chief engineer, a gentleman of the name of Eyre. He was a hero, if ever there was one. The surviving passenger tells how as soon as the vessel struck, and struck with a force that stopped the engines, the chief engineer ran down to see to the shutting off the steam, and to the opening of the safety-valves. Here was a man who took no thought of himself. How much the vessel was injured, how long she could keep afloat was no concern of his. He must have known that the injuries she had received were of a very terrible character, or they would not have stopped the machinery. But his duty lay in the engine-room. He had to prevent the now useless steam from hazarding the lives of those entrusted to his ship. He went knowing the probable fate that was in store for him—death of the most awful kind. Death in the engine-room of a sinking ship may come in many ways, at the best it is being drowned like a rat in a trap. The deck officers and crew have at least a chance of a swim for their lives. To them there may, and to some of them in this case there did, come floating wreckage or broken boats. But for the man who goes below all hope is left behind. It is useless to say more. The simple story speaks for itself. To my mind it is impossible to think of any deed more pathetic and more self-sacrificing than that of the chief engineer of the lost *Drummond Castle.*

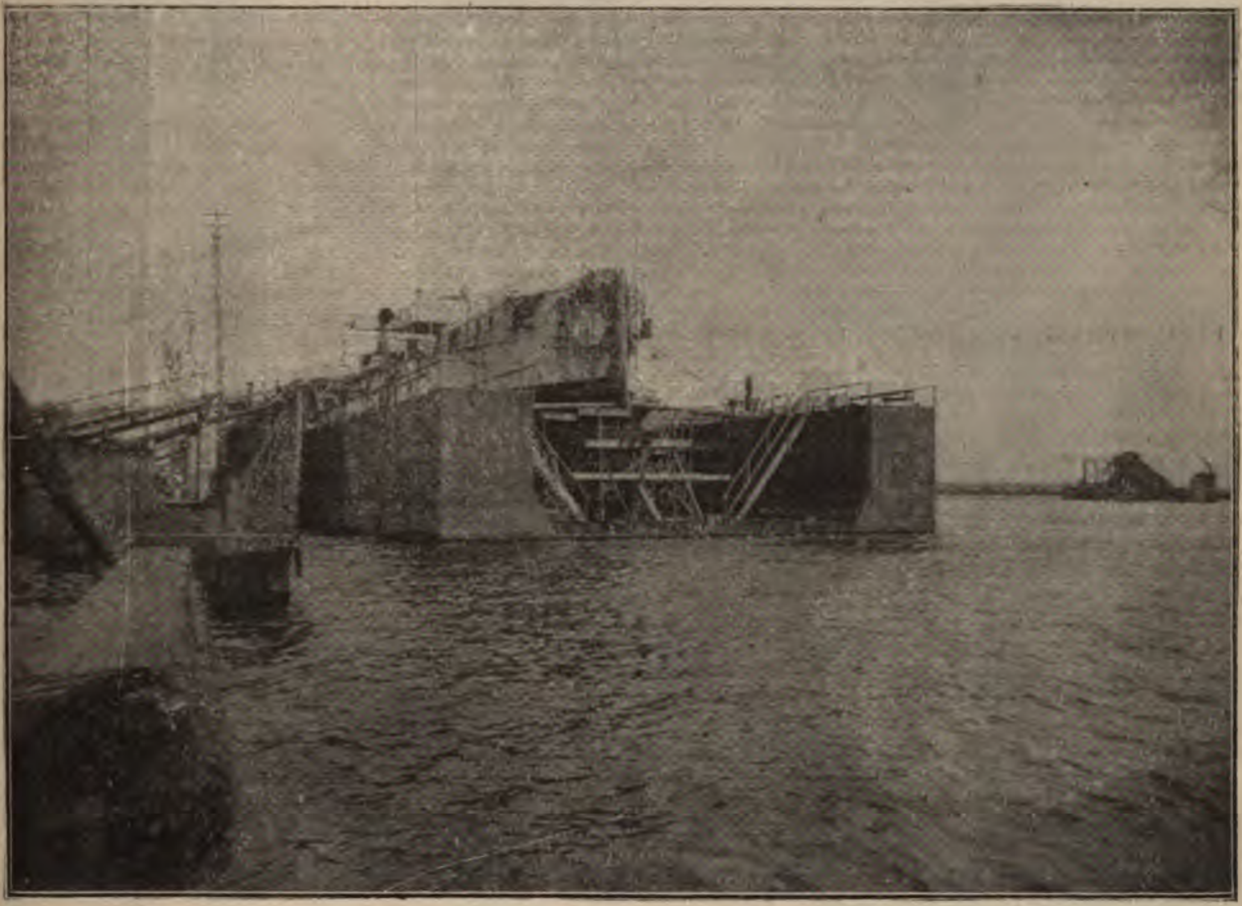
The Volunteer Fleet.

Though I spoke of this organisation in last month's Notes I do not intend to make any apology for reverting to the subject. For attention cannot be too frequently called to the doings of this association, which is building warships of the most formidable type (at least the type most formidable to commerce) and doing so without apparently arousing the least interest in the minds of the British authorities. It is now rumoured that no less than five 19½-knot twin-screw vessels are about to be contracted for. This is, of course, excellent news for our shipbuilders and engineers. It is a large order in itself, and if those who are responsible for the safety of this country are worthy of their trust it will mean an order for vessels of similar class to sail to the same seas under the blue ensign.

Spain, too, is adopting the armed merchantman idea. She has bought the old Inman Liner *City of Richmond,* though not, it is true, for cruising purposes. She hardly has the speed for that. She is to be a troopship, and so her long sojourn in the Gareloch is at an end. She has been lying there since she closed her brief career as a public yacht. The two vessels so far taken for arming have been from the fleet of the Transatlantic Company.

The Cape Liner "Scot,"

which, as our readers will remember, broke down on her outward voyage in December, 1895, and put into Vigo, has completed her extensive repairs and overhaul at Queen's Island, and is to resume work on the 18th of the month. This has been sharp work indeed. I shall hope to see something of her before she sails again to the southward, and shall therefore reserve my comments upon her till next issue.



Brazilian Ironclad, "24 De Mayo," in Floating Dock, Vulcan Works, Bredow, Stettin.

Fast Steaming on the Atlantic.

The Cramp-built *St. Paul* has attained the Southampton record, taking it from one of the Clydebank boats. The *St. Paul* brought the record on her route down to six days, 5 hours and 41 minutes to the westward. Her daily runs were 487, 522, 522, 513, 508, 518, and 41 miles, making a total of 3,111 miles, an average speed of 20·9 knots. This is an improvement of one hour and a half in time, and three-quarters of a knot in mean speed over the previous record on the route, which was by the *New York* two seasons ago. This too was over the long ice-season course.

The White Star *Teutonic* has also made her fastest run of the 84 passages she has made to the eastward. The time was 37 minutes under the six days, and the speed was 21·17 knots. Her runs were 417, 460, 473, 484, 476, 474, 108 miles, distance 2,892 miles. Of course, in comparing runs to the westward with those to the eastward it must not be forgotten that the American bound ship has a day of something like an hour and a half greater time than her east bound rival, and that thus with equal speed, Europe bound ships make worse daily totals.

The P. & O. Company,

as most of my readers know, has been very much improving the class of vessel employed in carrying the Indian Mails. From time to time I have chronicled the records of the *Caledonia* and the way in which London and Bombay have been brought into closer communication with one another, until the time of mail transit has been brought down to something near twelve days. The result of the pulling up not so much of the sensationally good passages as of the worse ones, has been that a ten days' interval has been cut off the course of post between the two centres. Thirty-eight days used to be the normal time for a letter to go out and for a reply to come back. Now a reply can be received in 28 days. A saving of six days has been effected by allowing the mail despatch from Bombay to be altered from Saturday till Friday, and this will benefit those who write from Bombay to England, as they will now just give their English correspondents time to catch the Friday's outward mail, whereas when Saturday was their despatch, their letters arrived just too late for replies.

LIVE STEAM FEED-WATER HEATER.

IT is now a generally accepted fact that feed water may be most economically heated, and to a much higher temperature than otherwise, by live steam taken from the boiler, and the preservative effect upon the boiler by a feed water of a high temperature is now well recognized.

We have, therefore, pleasure in illustrating an excellent form of such a feed-water heater manufactured under a sole license by Mr. John J. Royle, of Dalham Works, Manchester. A special feature of this heater is the application to them of Row's patent indented tubes, which offer so large and efficient a surface to the steam, and which we have already illustrated and described as applied to fresh water condensers in our November issue of 1895.

Referring to fig. 1, steam direct from the boilers, or after use in one or more cylinders, is admitted by a central tube through the valve C to the cylindrical chamber, and passing up to the gun-metal star D it spreads out within the surrounding indented tubes E, and gives up its heat to the feed water. After condensing, the water falls to the lower gun-metal box or cover F, passing by way of drain cock G to the hot well. The heater is fixed between the feed pump and the boilers. The feed enters the heater at A, and passing up through the body, around the tubes, leaves the heater at about boiling point at B. The body of the heater is bolted to bulk-head by means of brackets K K. Provision is made to inject soda by means of cock and funnel H, and the blow-down or scum cock is provided at the base of the heater body, shown at M, fig 2. It will be noticed from fig. 1 that the tubes are free at the upper end to expand and contract without putting strain on any of the joints. The heaters are generally made up with cast-iron body, copper tubes, and gun-metal fittings, and are suitable for the highest pressures in practice. For torpedo boats and other light craft, the shell is made of copper thus keeping down weight to the minimum. Owing to the high efficiency of the tubes the heaters are very compact. Heaters recently supplied for torpedo boats to deal with 6½ tons of feed per hour, only weighed 245 lbs. This we think most exceptional efficiency. The heaters are readily got at for cleaning purposes, and altogether they are a most reliable apparatus.

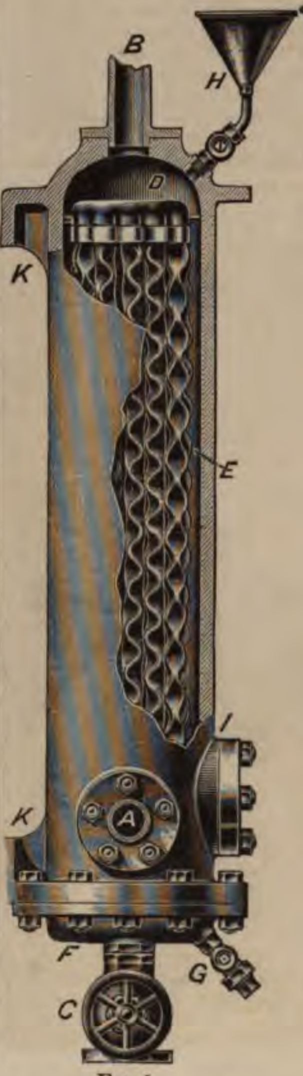


FIG. 1.

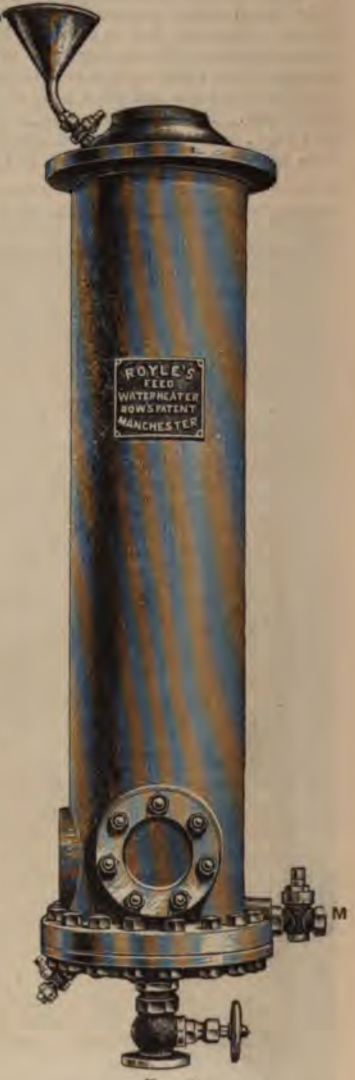


FIG. 2.

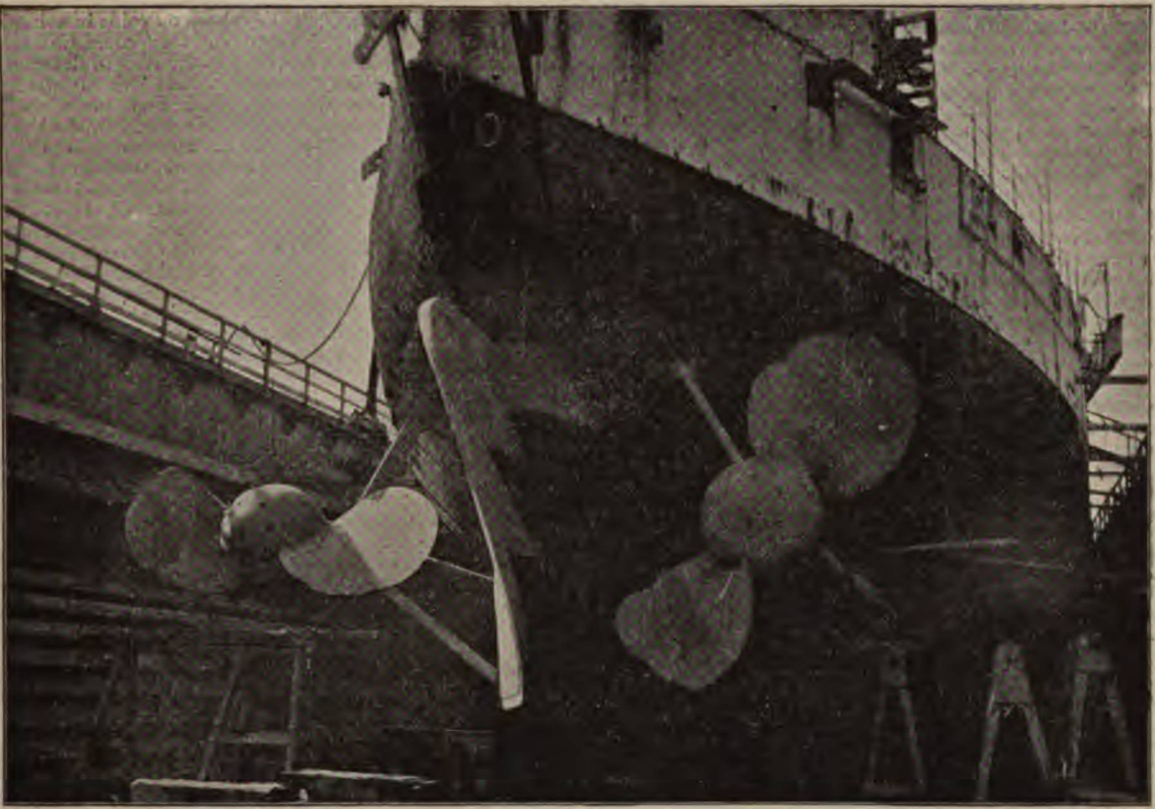
INSTITUTE OF MARINE ENGINEERS.

ANNUAL DINNER.

THE sixth annual dinner of the Institute of Marine Engineers took place in the King's Hall of the Holborn Restaurant on Wednesday evening, June 17th, a company of about 250 gentlemen sitting down to an excellent repast. The President (Sir Edwyn Sandys Dawes, K.C.M.G.) was in the chair, and among the guests were: Sir George Nares, K.C.B.; Sir James Mackay, K.C.I.E.; Vice-Admiral E. Field, M.P.; Lieut.-Col. Denny, M.P.; Mr. T. Richardson, M.P.; Mr. C. W. Cayzer, M.P.; Mr. A. J. Durston, C.B., R.N., Past President; Mr. W. Ellison Macartney, M.P.; Mr. W. Allen, M.P.; Mr. J. Fortescue Flannery, M.P.; His Excellency Commodore M. de la Camara Spanish Naval Attaché; Duncan Mackinnon, Esq. (Chairman British Indies Co.); Capt.

Chevalier Leopold Von Jedina, Austro-Hungarian Naval Attaché; Col. Poretchkin, Russian Imperial Navy; Professor A. C. Elliott, D.Sc.; Col. Dawes, the Revs. W. D. Springett, D.D., and G. M. Capell; Capt. McKirdy, Capt. Chalmers, Capt. Hodgkinson, Capt. Hogg, Capt. Hutchinson, Mr. C. Du Sautoy (President of the Southampton centre), Mr. A. Beldam and Mr. G. W. Manuel, Past Presidents; Alderman G. W. Kidd, Mr. A. W. Robertson, Mr. A. Thomson, and Mr. W. H. Northcote, Vice-Presidents; the Members of Council—Mr. J. H. Thomson (Chairman), Messrs. J. R. Ruthven, J. W. Richardson, W. White, F. W. Shorey, J. M. Gray, Blelloch, A. Campbell, A. G. Crichton, J. T. Smith, John Adamson, Sidney C. Sage, C. G. Newby, W. I. Taylor (Convener), J. Adamson (Secretary), and others.

During the dinner the Imperial Blue Hungarian Band played some excellent selections of music, which were much enjoyed, under the leadership of Mr. M. Clay.



Stern of Brazilian Ironclad, "24 de Mayo," Vulcan Works, Bredow, Stettin.

After the toasts of "The Queen" and "The Prince and Princess of Wales and members of the Royal Family,"

The President gave "The Navy, Army, and Reserve Forces," which he said was one that had an especial interest for that company, for to marine engineers and naval architects was due the steady improvement that had taken place year by year in the construction of our ships of war. The special occupation of marine engineers rendered them a vital portion of the Navy, for our lives and property should be as safe under the British flag, floating where it may, as it was in England. A third reason why it was especially interesting to them was because marine engineers contributed a very important portion towards the Royal Naval Reserve. They were all acquainted with the great changes that had taken place during the last 40 or 50 years in regard to the Navy. They could not overlook the fact that during this time most of the fighting had been done by the soldiers. Happily, for many years we had had no disagreement with any European Power, and long might it be before there was such a thing, but our army was at work quelling various little disturbances that occurred, for there must be fighting now and again. He had mentioned the Royal Naval Reserve. The reserve forces had year by year been increasing in efficiency, and at present there was no sign of the interest in the Volunteer force, afloat and ashore, lessening. During the last twelve months the merchant service had had the honour of supplying 100 young men for permanent service in the Navy, and for some time the Royal Naval Reserve officers had been in service with the fleet. He hoped the time was not far distant when the Admiralty would see the advisability of extending this privilege to the marine engineers. If in any time of emergency we needed a larger supply of engineers for the Navy it would be a calamity if we could not fall back upon men who had had, at any rate, some experience in H.M. ships.

Sir George Nares, who replied for the Navy, said the marine engineers had succeeded in taking away from the Navy the sails, but thank goodness they had not yet done away with the oars. He hoped they would not do so, for while they were continually increasing the engine-room and stoke-hole staff they could not change the character of the typical man-of-war's man. He was just as much wanted and to the fore as ever, and the only thing that changed was the schooling. The quick-firing guns, the torpedoes, electricity, and all these things were preparing a far stronger schooling for the service of our seamen in the future. It was far more trying for those who had to remain below, and continue their work in heat and smoke, and often shut in by bulkheads, than for those who were on deck, and could see the enemy, and return blow for blow. He could assure his hearers that the same spirit and the same go was in one and all of the crews on board the ships now, as there were in those of other days.

Col. Dawes, in responding for the Army, said that there had in later years been a continuous increase of efficiency in this branch of the service. This was not confined to Europe, but extended to the far East, and was very apparent in the late campaign between Japan and China. He thought the officers of the British Army to-day were as anxious to perform their duties thoroughly as ever was the case in times gone by, and all he could hope was that when the time came they would be able to hold their own and prove themselves as efficient as their ancestors.

Captain McKirdy, R.N.R., responding for the Royal Naval Reserve, said that he considered the reserve force a most valuable adjunct to the regular service, and in time of emergency it would be found indispensable to bring the ships of the Navy up to the full strength and all available for immediate action. Such being the case, it was a matter of the highest importance to see that the reserve in all its departments was efficient, and in the meantime he was unable to see that this was so. Of late many officers had been called to serve in Her Majesty's ships, and it was pleasing to know that this had been attended with satisfactory, and in some cases with eminently satisfactory, results. It was, however, a sacrifice to the Mercantile Marine, and should the men at any time be called upon to serve in a similar way to the officers, in any number, it would be another sacrifice, which might prove disastrous to the Mercantile Marine. The deck department was well treated in the Royal Naval Reserve, and was evidently appreciated by the authorities; but with regard to the engineer department there was very great room for improvement, and beyond a doubt the attention of the Admiralty was not called too soon to the wants of this branch of the reserve, and he hoped that the day had now come when the engineer officer of the reserve would enjoy the same privileges as his brother officer on deck.

Mr. James Laing proposed "The Houses of Parliament." He observed that they had reason to be proud of the Constitution. There were differences of opinion, political and otherwise, but he was sure they would agree with him that both Houses acted for the best interests of the country at large. It was well that there was an Opposition, for this gave the opportunity of criticism and thorough discussion, which brought out the good points of any measure, and expunged those that were bad. Should ever our liberties, or privileges, or our honour as a nation be menaced, no one would come forward more readily to defend us than the two Houses of Parliament.

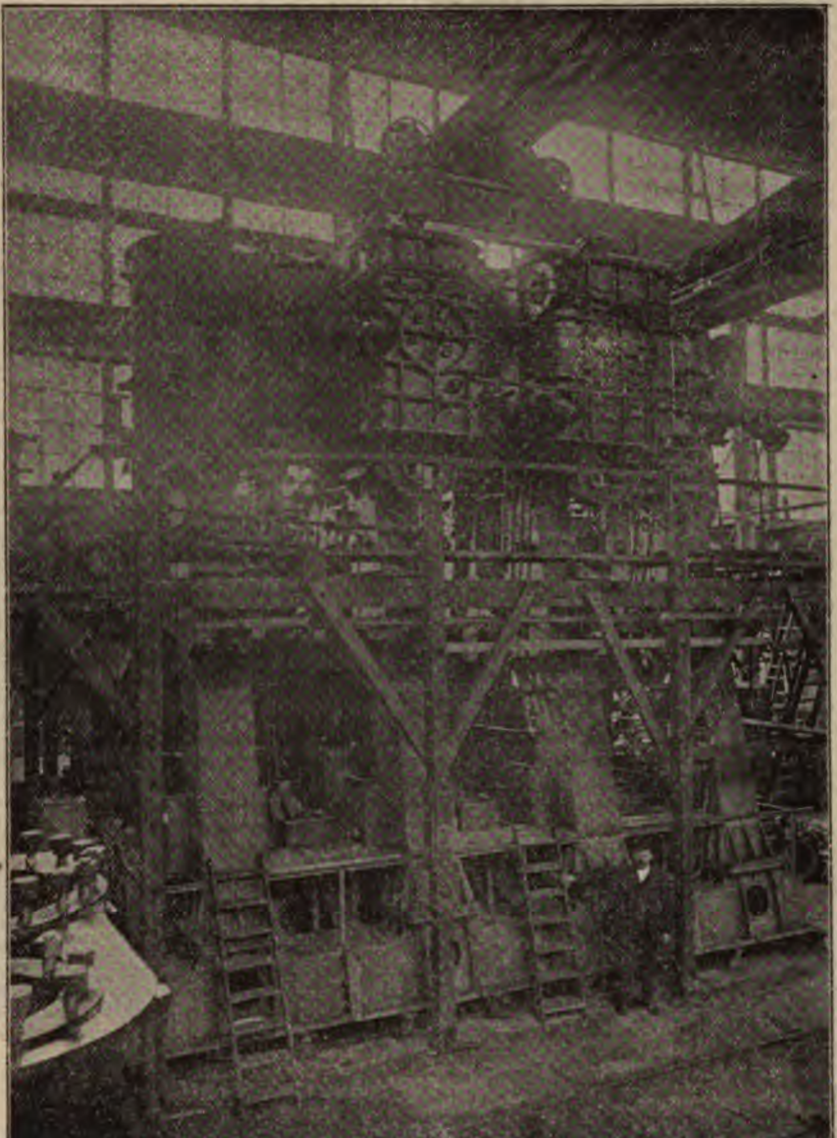
In response, Mr. Ellison McCartney, M.P., said that whatever might have been their defects, the Houses of Parliament had always stood up for that which was greater than Parliament—the British Constitution. On that account he trusted that whatever might be the vagaries of the House of Commons, it would merit some approbation from all. Nothing could be more useful than the manner in which the attention of the people of the country was being directed to the necessity for maintaining in the highest possible degree of efficiency the Navy of Great Britain. Happily the Navy was now exempt from the waves of party predominance, and he could not help thinking that in future the importance of the Institute of Marine Engineers, connected so closely as it must be with the naval efficiency of the country, was a thing on which they must reflect with complacency.

Vice-Admiral E. Field, M.P., submitted "Our ships, colonies, and commerce," and in doing so reminded his hearers that they must not forget the little word "we," for they all took a share in great enterprises, and on the sea it was the captains, the officers, the seamen, and the engineers working together that were necessary for carrying out the duties properly. The English shipping and tonnage was more than half that of the whole world; it amounted to over 13,000,000 tons, while that of the whole world was only 25,000,000 tons. Over 600,000 vessels left and entered British ports every year, and 1,900 daily, while the merchandise that had been dealt with reached the sum of 1,200 million sterling. The attention of statesmen had been concentrated on imperial federation, colonial federation, and commercial federation, but he maintained that they must begin with commercial federation among the colonies before they thought of imperial federation.

Sir James McKay, who acknowledged the toast, said that 65 years ago the British mercantile steam marine, consisted of 298 vessels, with an aggregate of 30,338 tons; to-day it consisted of 8,386 steamers, having an aggregate of 9,952,211 tons; so that 65 years ago, they might take it, there were something like 900 marine engineers, and now there were no less than 35,000.

Colonel Denny next proposed the toast of the evening, "The Institute of Marine Engineers." He said he felt it a great honour to be associated with the toast of a society in which his late father took such a deep interest. The tendency of the age seemed to be to form themselves into associations: there were the great trade unions, unions of employers and shipowners. What precise effect these would have upon the commerce of the world it was not for him to say. The marine engineers were formed into an association for the advancement of marine engineering scientifically. In old days they built a boat and put an engine in, and the engineer was simply a driver. But the pressure of competition came upon them, and they had to keep themselves up with the times; and in order to compete with nations that subsidised steamers very heavily they had to obtain scientific ideas of great inventions if they were to maintain their position. Steam was now carried up to 250 lbs. pressure in Mr. Allen's water-tube boilers, and all the various ideas and schemes were in the hands of the engineers. No shipbuilder or engineer worthy of the name objected to reports. Their duty was not to turn on the steam and go to sleep, but to make scientific discoveries, to find out how and why an engine was like a woman—with her tempers and her tantrums—and where the difficulties were in the machinery, and how to avoid them. Manufacturers did not look upon the engineers as critics; they did not always like to receive complaints, but no shipbuilder worthy of the name objected to reports from those in charge of the engines. They had to control the commerce of the world, and they must keep on going in a handicap race with other nations. He believed they could do this and come out first. Speaking on the patriotic view of the question, he said they must recollect that there were the bluejackets, and the executive staff, and there was the engineering staff. The one fought in God's light, but the other was down below with perhaps 1½ in. of air pressure round him, and he did not know what was going to happen, whether it might be a rock, or a torpedo, or anything else—he must do his duty. Where was the waste likely to be the greatest? In the engine-room; and although he acknowledged and revered the pluck of the deck hands, he gave the palm to those below. There were in the Navy a certain number of highly-trained engineers, but these were only the nucleus, and in case of war these and the firemen would give way first. They required drill as much as the bluejackets, for the simple reason that the machinery in ships of war was much more complicated than in merchant ships. Until the country was far-sighted enough to get a reserve it was not doing its duty. We, as a country, had attained to a position, and if we were to maintain it, every man must work and train himself, and the Government must give them opportunities for maintaining that maritime life which was the life of the country, and without which this country would go down as sure as possible. He submitted "Long life and success to the Institute of Marine Engineers," coupled with the name of the Hon. Sec.

Mr. James Adamson, the Hon. Sec., responding, said:—I thank you in the name of the Institute of Marine Engineers for your reception of this toast; indeed, it seems to me that the flame which enveloped it could hardly have fired the breast of the bird of mythology more than that which environs the responder to the toast at the present moment. It arises from the well-earned popularity of the proposer apart from his honoured name, and it is a name which will be ever revered by the founders of this Institute, and be handed down to those who may succeed us with like feelings; it is added to by your enthusiasm; it is fanned into a white heat by the natural condition of one unaccustomed to speak in such an assembly, and in the presence of so many of our national orators. The best escape from this Etna is to follow the golden rule and plan a brief elevation, and this I hope to do. By general consent on an occasion like this, statistics—and, indeed, all sticks, save *chop-sticks*—be left alone, although we have had some gentle hits to-night from Admiral Field, which we shall all doubtless lay to heart and accept the lessons in a meek spirit. The proof copies of the reports on the tables show the condition of the Institute. I seek to lead you, however, to the "*borderland*," not to hold converse with the spirits of the past, but to gaze into the vista of the future and behold the possibilities within our reach by stretching forth with our 1,000 and increasing thousands of members, as an Institute, that future which our pathway should adorn and grace with lasting memorials of the triumphs of science and art, achieved by aid of our instrumentality. It has oft been repeated and has almost become an adage that "Nothing succeeds like success," and, accepting this as true, we add that the foundation of this Institute is a success which has succeeded in attaining a place in history—a niche—shall I say in modesty a small one—in the temple of utility, if not of fame, and I doubt not but when Macaulay's aborigine—be he boor or serf—approaches the pinnacle of his ambition, even then the Institute of Marine Engineers will not be found wanting at his reception—it will probably be a warm one,—and when the nation's pulse-throbs are quickened by the an untoward event, and by the projection of mis-ith danger to the national weal, may the coolness which come from preparedness on the part of the of the nation be made manifest, not only in ecords, but in deeds. Engineers and shipbuilders ld that the introduction of improvements to the king practically new steamers obsolete before their not as a blessing but otherwise, by depreciating nnage, but, along with this let us remember that it is improve, in face of the knowledge that were we to hold back, others would commence where we left off, and thus we would but shift the lines of competition without lowering them for ourselves; and here I would add it is the aim of the Institute to urge it as the duty to assist, and as the duty of every ineer to improve himself and the machinery placed in his and do his utmost to reduce the cost of his department, ce the line of expenses as far below the margin of profit s possible, so that he may assist in maintaining the the right side of the books. It is no idle boast to as a nation—I emphasise *we* in deference to the miral Field in his speech to-night—have helped at least to engine the navies of the world, and have largely contributed to engineer them also, but the time has gone by when we could control the supply, and lay down the law for the tide of improvement to move not beyond our chair of vantage. Hence it is ours to move ahead, *nec remis, nec velis,* not with the oars nor sails of the past—noble and inspiriting as the history of that past has been—but with the new, and possibly a newer element as shadowed forth this evening by Sir James Mackay in his speech, which has, or may become, the factor for our calculations, in measuring by knots the expanse of ocean space.



Erecting Shop, Vulcan Works, Bredow, Stettin.

During last session we have read and discussed papers bearing upon subjects of every-day interest, each one freighted with its own special lessons in the direction of economy and improvement, and although none of the subjects were of a startling nature, yet the process of education was being advanced by one and all to the mutual advantage of writer and hearer. The session upon which we have entered has already shown fruits by which we can judge it as prepared to yield the palm to none of its predecessors. The papers we have had have been well received and discussed, while those which have been promised for the autumn and winter should be no less so; and if I may again refer to our assembly this evening, it needs no prophet to indicate the advantage gained by the presence of so many at our annual board meeting. It is intended to extend the operations of the Education Committee during the forthcoming winter, and to add to the drawing classes, which are held for the benefit of the graduates and younger members, simple elementary lectures on engineering and general subjects suitable for this section of our membership; and for these the co-operation of all interested in the progress of the rising generation is desired. This week in Glasgow the jubilee celebrations of Lord Kelvin are being held, when all the courts and universities of the world are represented to do him honour. I was privileged to be present at the ceremony on Monday, representing the Institute. It was a great and important assembly, and the knowledge that Lord Kelvin, the greatest scientist of the day, is one of our past presidents, and that Sir Edwyn Dawes is our present president, gives us a consciousness that we have attained to heights which only the most sanguine of the early promoters of the Institute were able to see with prophetic eye. Past and present being so, let us still move forward in all that is good, and true, and noble. Meantime we separate for the restoring balm of nature's giving, and for that respite from our duties which adds to our mental and physical capability; and when our session reopens in September may it be to set our hands to the plough anew with twofold energy, to receive our president at our own premises, and give him a regal welcome.

Professor Elliott gave "The Visitors and kindred institutions," which was acknowledged by Captain Chevalier Leopold Von Jedina, and Mr. T. Richardson, M.P.

Mr. A. J. Durston, in proposing the health of the chairman, said he had been instrumental in opening new grounds for them as marine engineers. They looked to him and men like him to maintain the proud position we as a nation had held as the greatest carriers of the world. The president had been engaged in the highest and best occupation; in welding together the peoples of the world by the mutual interest in which he had been engaged, and which worked in the interests of peace. In him they had one of the largest employers of marine engineers, and their wishes for his success and prosperity, and above all, good health to enjoy the same, would be all the more hearty because of the threefold position he held of merchant prince, pioneer of employment, and president of the Institute.

The President briefly returned thanks, and also thanked the convener, Mr. Taylor, for the trouble he had taken to make the gathering a success.

During the evening vocal music was rendered by Miss Jessie Hotine, Miss Ethel Bevans, Mr. Dalgety Henderson, and Mr. Franklin Clive, the latter being an able musical director.

NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS AT CARDIFF.

THE North-East Coast Institution of Engineers and Shipbuilders held their first meeting away from the North of England, on Tuesday, June 23rd, at Cardiff. At 9 a.m. that day the Mayor (Lord Windsor) entertained the council of the Institution to breakfast at the Angel Hotel, other guests including Mr. Llewellen Wood, Mr. Charles Heywood (chairman of the local reception committee), Mr. J. F. Walliker (hon. secretary and past vice-president), Alderman David Jones (deputy-mayor), and Alderman Carey (ex-mayor). A meeting of the council subsequently took place, and at 10 o'clock there was a gathering of the members of the institution in the assembly-room of the Town Hall, where an official reception was held by the Mayor (Lord Windsor), supported by the deputy mayor, ex-mayor, and the majority of the aldermen and councillors of the corporation. Amongst those present were—Mr. Thomas Richardson, M.P., West Hartlepool, acting President of the Institution; Mr. Hugh Macoll, Sunderland; Mr. J. R. Fothergill, West Hartlepool; Mr. J. Gravell, chief surveyor of the Bureau Veritas, Vice-President; Mr. G. E. Macarthy, Newcastle, treasurer; Mr. John Duckitt, Newcastle, secretary of the Institution; Mr. H. H. Wake, chief engineer to the River Wear Commissioners; Colonel Bingham, Sheffield; Mr. Robert Thompson, Sunderland; Mr. Charles Thompson, Sunderland; Mr. R. Hirst, Hartlepool; Mr. Riley, Stockton; Mr. G. H. Baines, West Hartlepool; Mr. Taylor, South Shields; Mr. Buchanan, Glasgow; Mr. Campbell (Messrs. Robert Stephenson & Co.), Gateshead; Mr. Macglashan, Sunderland; Mr. Graham (of Messrs. John Brown & Co.); Mr. Arthur Barrett, West Hartlepool; Mr. W. G. Reynolds, South Shields; while among the local gentlemen present were Mr. John Gunn (President of the Chamber of Commerce), Mr. Llewellen Wood, Mr. Charles Heywood (chairman of the Cardiff reception committee), Mr. Walliker (hon. secretary of the local reception committee), Mr. Marcus Gunn, Mr. C. L. Ryder (hon. treasurer of the Bristol Channel Centre of the Institute of Marine Engineers) and Mr. T. W. Wailes.

Light refreshments supplied by the Mayor having been partaken of, the party left for the Great Western Railway Station, where they embarked on a special train for Newport. Before leaving the Town Hall, however, they gave three hearty cheers for Lord Windsor.

The journey to Newport was under the "pilotage" of Mr. T. C. Calder, the indefatigable hon. secretary of the local committee at Newport, who was present. The train was run on to the Alexandra Dock Co.'s lines, and steamed down to the junction between the North and South Docks, where the company, numbering in all 105, alighted. They were received by Colonel Lyne, local director of the docks; Mr. Henshaw, general manager; Mr. W. S. Smyth, managing engineer; Mr. Albert Spicer, M.P. for the boroughs; Mr. T. E. Watson, president of the Newport Chamber of Commerce; Mr. J. H. Carney, chairman of the Newport committee; Mr. T. W. Pearson, docks engineer; Mr. M. Mordey, Councillor J. H. Dunn, Mr. Flanders, Mr. G. H. Thomas, Mr. C. H. Bailey, Mr. R. Williamson, Mr. T. A. Levison. Mr. T. A. Hawkes, Captain Parfitt, dockmaster; Captain Pugsley, harbour-master; Mr. A. J. Phillips, clerk to the harbour commission; Mr. E. J. Summers, clerk to the pilotage commission; and other public personages. A tour of the docks was made, showing the new coal-shipping appliances. Afterwards the whole company was driven in open carriages, provided by the Newport committee, to various works. The establishments thus open for inspection were those of Messrs. R. Arthur & Sons, Newcastle Engine Works; C. H. Bailey, Tyne Engine Works; L. G. Laurie & Co.; Mordey, Carney & Co., shipbuilders and drydockers; Newport Engineering and Ship Repairing Co.; Newport Ropery Co.; C. D. Philips's Emlyn Engineering Works; Richards & Hopkins' Britannia Engine Works; South Wales Brattice Cloth and Indiarubber Co.; Thompson & Hawkes, Wear Engine Works; Union Dry Docks Co.; and the Uskside Engineering and Rivet Co.'s Works.

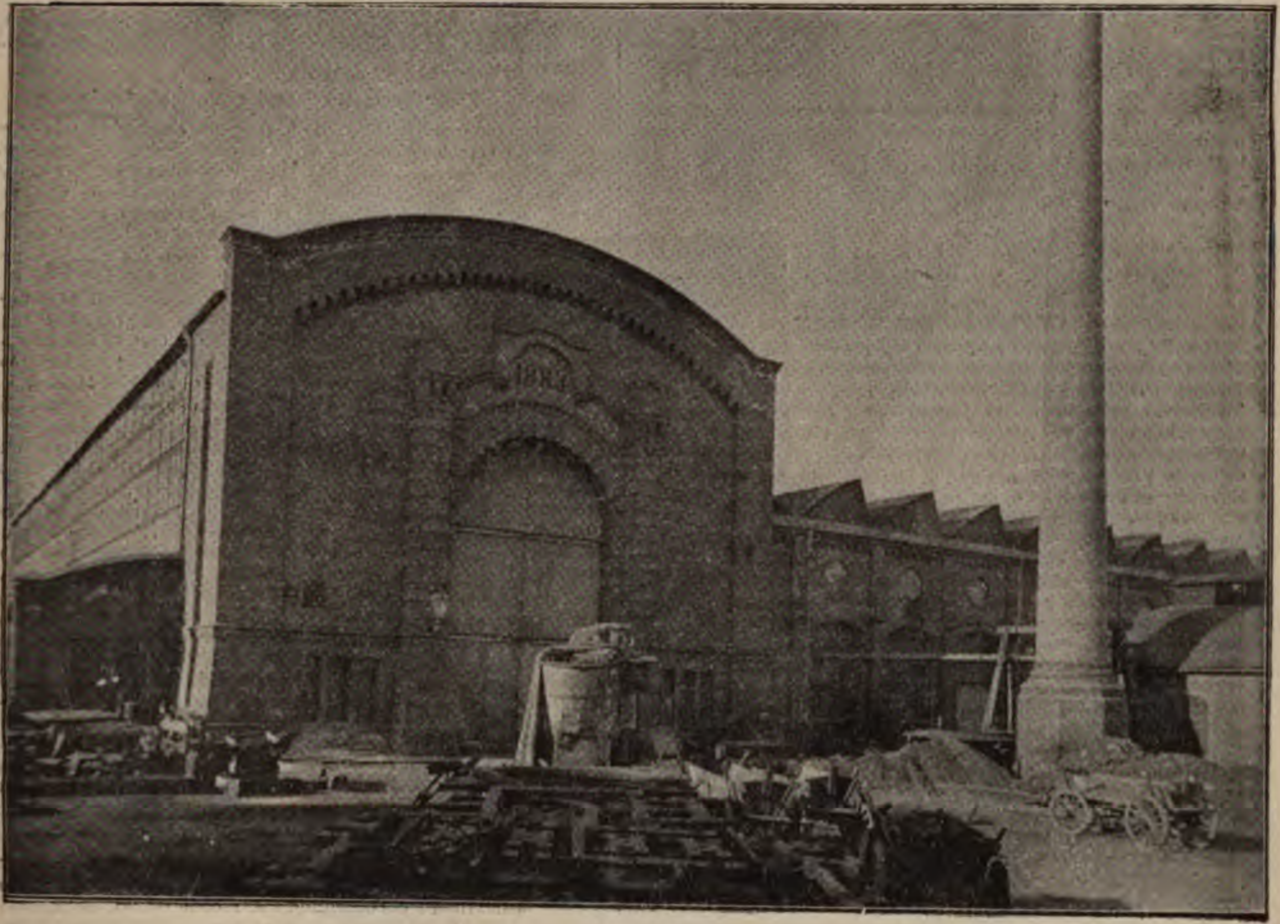
At 1.30 the party sat down to luncheon at the Tredegar Hall. The chair was taken by Mr. Albert Spicer, M.P. (in the absence of the Mayor), who was supported by Mr. T. Richardson, M.P. (Hartlepool), Colonel Lyne, Mr. T. E. Watson (President of the Newport Chamber of Commerce), Mr. W. E. Heard, Mr. M. Mordey, Mr. J. H. Carney, Mr. Checci, and many others. The company numbered altogether about 200.

In the afternoon the visitors embarked on board the passenger steamer *Lady Margaret*, by invitation of the Newport Harbour Commissioners, and went for a cruise down the River Usk and along the Monmouthshire coast to Cardiff. Before disembarking, Mr. R. Thompson, of Sunderland, expressed, on behalf of the Northerners, the great thanks they felt to the Harbour Commissioners for giving them the opportunity of seeing the coast by water.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our own Correspondents at home and abroad.)

AT this period of the year the thoughts of all who are interested in naval affairs naturally turn to manœuvres, in expectation and anticipation of the forthcoming programme. This year it was rumoured, and on good foundation, that there would be no manœuvres, and that the mobilization would resolve itself into the commissioning of a few torpedo boats and destroyers. It is now certain what vessels will hoist the pennant, and that the total number of vessels employed will exceed that of last year seems very probable. The date also has been announced, and falling on July 8th, is rather earlier than usual. This date is fixed by the termination of the school courses at the educational establishments and by the time allotted for the annual docking of the ships in the "A" division of the Fleet Reserve. For several years, however, one thing and another has operated to retard the mobilization, and instead of taking place in July the manœuvres have often been postponed until August. That they will be earlier this year is on the whole advantageous, although July is not infrequently a wet month on the Channel. The reserve of ships, in spite of the large additional number in commission, is good, although there are no modern battleships ready except the *Renown*. The lists below show that in small craft there is excellent provision, and the estimate of the men in the depôts leads us to suppose that there will be no scarcity experienced in this direction, although it is very probable that the west country establishment may be drawn upon to supply some ratings in which the other depôts are short. There are no very obvious symptoms, however, of that great lack of men of which we have heard so much of late, but as to the untrustworthiness of which considerable evidence has been given at times in these columns. The return of several vessels from abroad, paid off, has also apparently brought the supply of officers and stokers up to the required standards.



Front View of Erecting Shop, Vulcan Works, Stettin.

The Reserve of Ships and Men.

Of the vessels in the "A" division of the Fleet Reserve, or those in "B" division so nearly ready as to be practically included in this category, the following list is comprehensive, the ports at which they are stationed being shown by the initial letters P., D. and C., for Portsmouth, Devon and the Medway. There are twelve of the older ironclads, some of which are now officially classed as cruisers—the *Agamemnon* (D.), *Agincourt* (C.), *Ajax* (C.), *Belleisle* (D.), *Bellerophon* (D.), *Hercules* (P.), *Hotspur* (C.), *Monarch* (C.), *Northumberland* (D.), *Sultan* (P.), *Superb* (C.), and *Temeraire* (D.), with two of the defence ships, the *Cyclops* (C.), and *Gorgon* (D.), There are nineteen cruisers including the new *Talbot* (D.), the *Andromache* (C.), *Apollo* (P.), *Brilliant* (C.), *Forth* (D.), *Iris* (D.), *Indefatigable* (P.), *Iphigenia* (P.), *Latona* (P.), *Melpomene* (P.), *Naiad* (P.), *Phæton* (D.), *Pearl* (D.), *Sirius* (D.), *Severn* (C.), *Thames* (D.), *Tribune* (C.), *Terpsichore* (C.), *Thetis* (C.). The sloops *Algeriene* (D.), and *Phœnix* (D.). Twelve gunboats—the *Antelope* (D.), *Alarm* (C.), *Alert* (C.) *Gossamer* (C.), *Grasshopper* (C.), *Harrier* (D.), *Hazard* (D.), *Hussar* (D.), *Jaseur* (C.), *Rattlesnake* (P.), *Slaney* (C.), and *Speedwell* (D.). The destroyers are also twelve in number, and comprise—the *Charger* (P.), *Hardy* (C.), *Haughty* (C.), *Havock*, *Hasty* (P.), *Hunter* (P.), *Porcupine* (C.), *Quail* (D.) *Ranger* (C.), *Rocket* (D.), *Shark* (D.) and *Sparrowhawk* (D.). There are also in Reserve the following torpedo boats—Nos. 26, 27, 49, 77, 50, 59, 60, 66, 71, 79, 83, 84, 94, 95 at Portsmouth; Nos. 64, 65, 67, 68, 72, 73, 74, 90 at Chatham; and Nos. 45, 52, 53, 55, 57, 58, 80, 85 at Devonport. Altogether, 30 boats, making a total of eighty-nine vessels of all descriptions ready to hoist the pennant. So far as the supply of bluejackets and marines is concerned, there are in the depôts and barracks, &c., at Portsmouth, ready for service in an emergency, upwards of 6,000 seamen of all ratings—400 Red and two hundred Blue Marines; at Devonport there are 7,000 seamen ratings available and 400 Red Marines, while at Chatham and Sheerness there are 3 000 seamen ratings and 400 Red Marines. These figures give a total of 16,000 seamen, stokers and other bluejacket ratings, and 1,300 marines.

Grand Manœuvres or Tactical Exercises.

The authorities did not appear to be able to make up their minds as to a programme without a deal of consideration, and some pressure in Parliament and the Press. A letter in the *Times*, signed "Civis," a signature which many will connect with the original proposal for starting a Navy League, drew attention to the rumour that there would be no manœuvres at all, and argued that this was altogether a mistaken course to take. There ought, the writer thought, to be grand manœuvres, and not mere tactical exercises. The difference between the meaning of these terms may be explained. The former means, of course, such experiments in the solution of strategetical problems as were carried out in the early years of naval manœuvres. The latter has been defined as "the regular evolutionary routine of organised fleets at sea, combined for the tickling of the ears of the groundlings, with some strategical or quasi-strategical operation, so arranged as to make a great show with very little result." The result of this letter was a question in the House of Commons, to which the First Lord of the Admiralty replied that there would be manœuvres this year, and that Sir Frederick Richards had been for some time engaged in arranging the plan of operations. Immediately afterwards official instructions were sent to the naval ports ordering the dockyard authorities to prepare for mobilisation for "tactical exercises" on July 8th. A subsequent order altered the phrase to "manœuvres," so that it is highly probable that grand manœuvres will take place. It is also rumoured that a naval review will take place for the benefit of Li Hung Chang, the Chinese plenipotentiary, who will shortly visit these shores.

Return of the Italian Visit.

It will be remembered that last year an Italian fleet paid a visit to Portsmouth, and that great festivities took place in its honour. This year a return visit has been paid by the British Mediterranean Squadron to Italian ports, and naval amenities have taken place of a similar nature. Most warm-hearted and enthusiastic was the reception given to our officers and seamen at Civita Vecchia, at Rome, and at Naples. Sir Michael Culme-Seymour was received in private audience by the King of Italy, and was presented to the Queen. At a luncheon given by the British ambassador to the officers of the fleet many of the Italian ministers were present, and several official banquets also took place. The most notable feature of the visit was the welcome given by the Pope to some 300 Roman Catholic seamen and marines, who were present in the Sistine Chapel when his holiness celebrated mass, and were afterwards entertained at dinner in the Portico Carlomagne. All the officers present, both Roman Catholics and Protestants, were also presented to the Pope. At Naples the same kind of reception and hospitality was displayed, and altogether the visit of the fleet may be looked upon as another sign of the cordial relations existing, not only between the political heads of the two countries, but between their peoples also. At the same time that these friendly acts were taking place in Italy, the officers and men of the *Blenheim* and *Charybdis*, who had acted as an escort to the yacht conveying the Duke of Connaught to St. Petersburg, were being splendidly entertained by their *confreres* at Cronstadt. The Russian officers gave a reception, followed by a dance and a supper, on board the ironclad *Gangut*, and this hospitality was reciprocated by a similar function on board the *Blenheim*, to which the principal naval and military officers of the port and the officers of the foreign vessels present were invited.

The Admiralty Inspection.

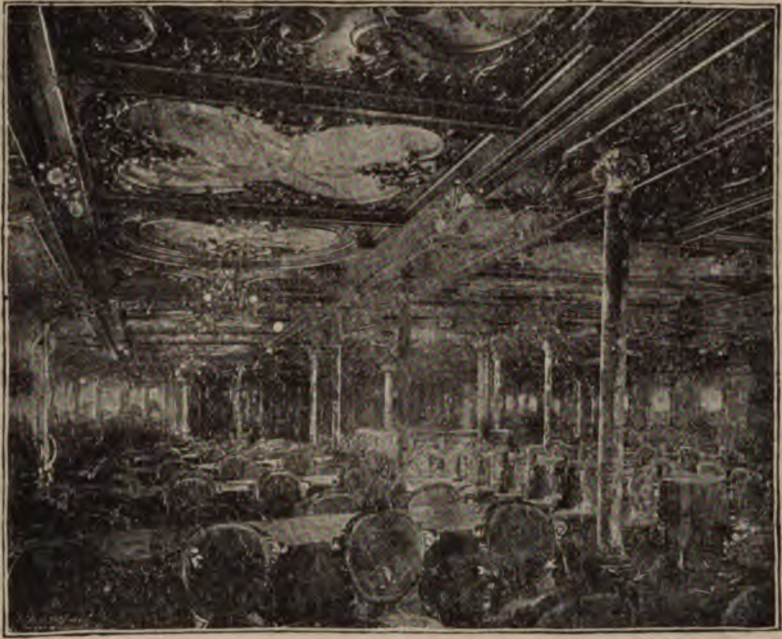
This annual perambulation or stock-taking of the chief officials at Whitehall occupied a shorter space of time this year than is usual. Possibly this was owing to the circumstance that several of their Lordships had been round the yards recently and the visit on this occasion was therefore rather for the personal advantage of the First Lord. The progress made in some respects is very striking, in others not such as might have been expected and hoped for. During the administration of Lord Spencer 10 battleships were laid down in public and private yards. Of these vessels the *Magnificent* and *Majestic* are already in commission, and the *Renown* is ready for sea, and will, it is anticipated, be commissioned for this year's manœuvres. Of the remaining vessels, the *Prince George*, *Hannibal*, *Jupiter*, *Mars* and *Victorious* are in the water, while the *Cæsar* and *Illustrious* are still on the stocks. The *Victorious*, which was laid down at Chatham in May, 1894, and launched in October, 1895, is fast approaching completion so far as the hull is concerned. Her armour-plating is virtually all in place, nearly 3,000 tons of Haveyed steel having been used in the process. The machinery is being supplied by Messrs. Hawthorn, Leslie & Co., and although one of the cylinders had to be taken out, necessitating considerable pulling about, it is probable that this will not postpone the trials, and that by September the vessel will be completed. The *Prince George* at Portsmouth is similarly advanced, and should be completed a month earlier if all goes well. On the other hand, the remaining battleships have made comparatively little progress. As regards the cruisers of the Spencer programme, the *Talbot*, *Eclipse*, and *Minerva* are fairly advanced, and several of the *Diana* class have been delivered. The *Powerful* and *Terrible* too should both be in the dockyard hands by the dates fixed, one being already delivered at Portsmouth. Of the ships of the *Arrogant* class, that at Pembroke seems to be leading at present, but the forty odd vessels of the Goschen programme have not advanced much further than the laying off stage.

The "Powerful" and "Terrible."

It is not too much to say that of late years no ship's trials have attracted so much interest as will these two important cruisers. Not only the various trials, but their subsequent performances at sea when attached, as it is said they will be, to the Channel Squadron, will be watched with the greatest interest and anxiety. The reason is not far to seek; the "battle of the boilers" so far as polemics and discussion in the Press or on the platform are concerned has resulted in a victory for the advocates of the water-tube and the defenders of the Admiralty, but it is now that the real test is to be applied which is to prove if theory is borne out by practice. The *Terrible* is the first of the pair to be ready, and has been delivered after sundry successful trials on the Clyde, to the authorities at Portsmouth by Messrs. J. & G. Thomson, her builders. Her unofficial trials took place on June 22nd and 23rd, and are reported to have been most satisfactory, a good omen for those which are to follow. Very interesting in connection with these trials are those of the Russian volunteer cruiser *Kherson*, to which we have already briefly alluded. This vessel is fitted with twenty-four Belleville boilers, of the same kind, therefore, as those in the British cruisers. These boilers were, on May 16th, subjected to what has been described as a severe test, for with indifferent coal and inexperienced stokers the vessel was kept under steam for eighteen hours, during which time in twelve hours she kept up an average speed of 19.6 knots. The report states that there was always an excess of steam, and that the engines worked better, while the power and speed increased as the trial progressed. This is of course merely corroborative evidence of the experience gained in the French Navy and Mercantile Marine, but it is worthy of note for all that. The *Powerful* should not be long behind the *Terrible*, and in these vessels the Navy should, by the early part of next year, receive a remarkable reinforcement and important accession of strength.

United States Navy.

If our own statement of progress with new ships does not present an altogether favourable appearance, that of some of our friends is not more encouraging. A recent official document, issued by the Chief Constructor of the United States Navy, shows that work on the new vessels has not been advancing so rapidly as might be wished. The battleships of last year's programme, the *Kearsage* and *Kentucky*—which, by the way, all the industrious compilers of naval statistics always pitch into the scale to weigh down the English beam, are not yet begun. Nor have the gunboats Nos. 10 and 13 (practically third-class cruisers) been yet laid down. Two other gunboats, Nos. 14 and 15, were at the time of the issue of the report only 8 per cent. constructed; and a torpedo boat, No. 8, had made as much progress. Still, two more gunboats, Nos. 11 and 12, were 11 per cent. advanced; and a submarine torpedo boat had 27 per cent. of her hull together, and it was hoped would be ready for launching this summer. Three other torpedo boats, not for submarine purposes, Nos. 3, 4, and 5, had advanced 38 per cent., and this completes the work on the stocks. Of vessels launched and named, the cruisers *Nashville*, *Wilmington*, and *Delaware*, at the Newport News Shipbuilding Co.'s works, are given a percentage of completions which varies in the several ships from 78 to 79. The *Brooklyn* cruiser is 80 per cent. completed, and is practically ready for delivery. The *Puritan*, monitor, is 95 per cent. completed, and the *Oregon* battleship 98 per cent., so that these vessels have little more than the finishing touches to be put to them. The *Oregon* was laid down in 1891, and the *Puritan* was launched in 1883, so they have been a little while in hand. The *Massachusetts*, a sister ship to the *Oregon*, is ready for sea, the third ship of the trio, the *Indiana*, being already in commission. It was this vessel, it will be remembered, that in October last attained a speed of 15·6 knots over a measured course at sea. The only other vessel of any size in hand is the *Iowa*, to be completed next year.



Dining Saloon. (*See page* 144.)

Ladies' Drawing-Room. (*See page* 144.)

Trials of the "Eclipse."

This second-class cruiser, a sister to the *Talbot* and *Minerva*, was built and engined at Portsmouth. Her machinry consists of two sets of three crank triple-expansion engines, with cylinders 33 in., 49 in., and 74 in. diameter, by 39 in. stroke. Each cylinder is supported by two wing columns of cast steel, and one middle line or back standard of cast-iron, of the usual A design. The main bearing frames, piston, cylinder and slide covers are of cast steel, and the ordinary double excentric gear is used for actuating the slide valves, the reversing motion being of the all-round pattern, which is now alone accepted for ships of the Royal Navy. Steam is supplied from eight boilers of the Scotch return multitubular type, each boiler being 14 ft. 6 in. in diameter, and 9 ft. 11½ in. in length. There are 24 corrugated furnaces of 3 ft. 9 in. in diameter, each fitted to give a total grate surface of 630 ft. The ship made her official eight hours' trial on June 22nd, and with entirely satisfactory results. She was not down to her normal draught of water, but drew 18 ft. 8 in. forward, and 22 ft. 4 in. aft. After leaving Portsmouth, the ship passed to the eastward of the Isle of

Wight, and then ran down Channel until off Portland Bill. Here the course was reversed, and the vessel carried to the eastward until off Brighton, when she returned to Spithead. Within an hour of getting under way the indicated H.P. of 8,000 was attained, and this was subsequently increased to as much as 220 above the demand. The engines worked most smoothly, and without hindrance of any kind, the average temperature in the engine-room being 85 degrees. The following were the chief results of the trial:—Steam in boilers, 152·7 lbs.; vacuum, starboard, 25·7 in., and port, 26·5 in.; revolutions, 135·7; and total I.H.P., 8,220, with an air pressure of only 39 in. The average during the run was 19·2 knots.

French Types of Warships.

While Admiral Fournier in his brochure, the "Flotte Nécessaire," argues that one type of warships is sufficient for all purposes—and that type an improved *Dupuy de Lome*—the French Minister of Marine is also taking steps which indicate an unsettled state of mind in regard to this question. The latter official has recently addressed to officers in command of all men-of-war an instruction to furnish him with reports embodying their views as to the best type of war vessel for modern conditions of battle, and the character of the armament they consider it would most advisable to furnish their *beau ideal* of a fighting ship with. So far the replies of the French officers have not been made public, but Admiral Fournier's pet ship will hardly meet with any great favour amongst them after they have perused the critical article on the subject which appeared in the current number of *Blackwood*. His improved *Dupuy de Lome* is a vessel of 8,300 tons, with greater speed and range than his prototype, and a heavier armament, including two of the largest quick-firers (presumably of 9-in. calibre), and 6-in. Harveyed armour for her plating. These vessels are to cost £400,000 each, and to be built within two years. It is noteworthy that Admiral Fournier's objection both to armoured deck protection pure and simple, as in the *Terrible*, and to a narrow water-line belt, as in the *Ruric*, finds an echo in the circular of the Minister of Marine, who draws attention to the great importance of high explosive shells of large capacity, and their result on in sufficiently protected vessels. Another French writer refers to this tendency to spread vertical armour over the greater part of the hull, which is so apparent in projected construction on the other side of the Channel, and he maintains that owing to the comparative thinness of armour so distributed it will have to be abandoned. He affirms that high explosive shells of large calibre have passed through six inches of steel without bursting, and he advocates therefore thicker armour on the vital and more important parts of the ship.

The "Himalaya" Troopship.

This historic vessel, which for more than forty years did good work in transporting our troops and seamen all over the world, is now entering a new phase of her existence, one, perhaps, not less useful in its way than that for which she can no longer be employed. The first trip the *Himalaya* made for the Government was in February and March, 1854, when she carried the 93rd Highlanders, and detachments of Artillery, Engineers and Rifles to Malta. She had been doing passenger service for the P. & O. Co. before this date, and was not immediately purchased into the Naval service. She is now being converted by Messrs. Earle's, of Hull, into a coal hulk for Devonport. All her masts have been removed, and everything above the upper deck has been cleared away. The saloon cabins, lower deck, store-rooms, magazines, boilers and machinery, have also been taken out of her, thus affording a deep hold from the main deck downwards, which is subdivided by iron athwartship bulkheads into four large compartments, capable of containing 4,000 tons of coal. The main deck will also give storage for 500 tons, thus giving a total coal capacity of about 4,500 tons. It is said that the vessel is still in splendid condition and will last for many years to come, and that if a shipbuilder wished to turn out a similar ship now he could not do so, for he could not obtain iron of the same quality to do it with. The old figure-head of the ship, which represents an Indian chief, is to be preserved at Devonport Dockyard as a memento of the good work the *Himalaya* did on trooping and relief service.

New Ships for the Argentine and Brazil.

The Argentine Government have recently purchased from the Italians two remarkably fine cruisers, one of which was built at Sestic Pinente, and the other by Messrs. Orlando at Leghorn. The *San Martin*, as she has been renamed, was originally the *Varese*. She is of 6,840 tons displacement, and is 328 ft. long, with 59 ft. 8 in. beam, and 23 ft. 3 in. draught of water. Protection is afforded by a 6 in. belt of Harveyed steel, and similar steel of the same thickness covers her turrets. Her protective deck is of 1·5 in. steel. The armament consists of two 9·8-in. breechloaders in turrets, ten 5·9-in., six 4·7-in. and 2·9-in., all these being quick firers. There are also twenty lighter pieces and two machine guns. The torpedo-tubes are five in number. Engines of 13,000 I.H.P. are expected to give her a maximum speed of 20 knots, and her normal coal storage is to be not less than 600 tons, which it is reckoned will give her a larger range of action. The *Jose Garibaldi*, a sister cruiser, has made satisfactory trials, and has been delivered to the Argentine representatives. Brazil, inspired doubtless by a desire not to allow its neighbour to obtain a superior Navy, is also showing activity in this direction. Several small armoured vessels and cruisers have been ordered from private shipbuilding firms in England and France, while at Kiel a German firm is constructing three torpedo gunboats for the same Power. One of these latter, which has been given the name of *Caramura*, has been launched. With a displacement of 1,030 tons, her length is 259 ft., beam 30 ft. 3 in., and draught of water 10 ft. 2 in. The armament this vessel will carry consists of two 4-in., six 2·2-in., and four 1·4-in. quick-firers. She has also three torpedo-tubes. It is expected that on trial she will develop a speed of 23 knots, for which purpose she is to be furnished with engines of 6,000 I.H.P.

The Names of our Warships.

The principle upon which the ships of Her Majesty's Navy are named has been called in question by Mr. Arnold Forster, M.P., who in the House of Commons interrogated the First Lord of the Admiralty on the subject. Mr. Arnold Forster directed his queries rather to the naming of some of the torpedo-boat destroyers by too pacific sounding appellations than to the general question; but this has been raised in the correspondence which has since appeared in several quarters. It does seem, at the first glance, that such designations as *Violet*, *Dove* and *Pilgrim*, are rather inappropriate for destroyers, nor is the excuse made by Mr. Goschen that it is less troublesome to take old names out of the signal book than to add new, very sufficing. The truth is, names for destroyers have not been considered of any great importance, while those for the larger vessels have at least in many cases of late been selected because of the associations attaching to them. It is obvious to those who examine the correspondence on this subject that the majority of civilians do not, perhaps they cannot, regard this question with a Naval mind. In nine cases out of ten they want to commemorate some hero of their own selection, or have formulated some pet scheme by which the characteristics of a ship are to be made known to all and sundry by her name. Naval men want something entirely different: it is their wish that the crews of the ships shall be inspired by the sentiment that the names have already been rendered illustrious by connection with daring achievements and gallant deeds performed at sea. The civilian, when he reads that a vessel has been named *Canopus*, goes to his Lempriere or to some work on astronomy for information, when he should turn instead to his Naval history. He connects the *Pickle* with Crosse & Blackwell and not with Trafalgar and Nelson. This is the mistake underlying much of the civilian criticism on this point. Surely the naming of the streets and roads should suffice for his purpose and the nomenclature of our ships of war be left to the men who are to fight in them.

Launching a French Cruiser.

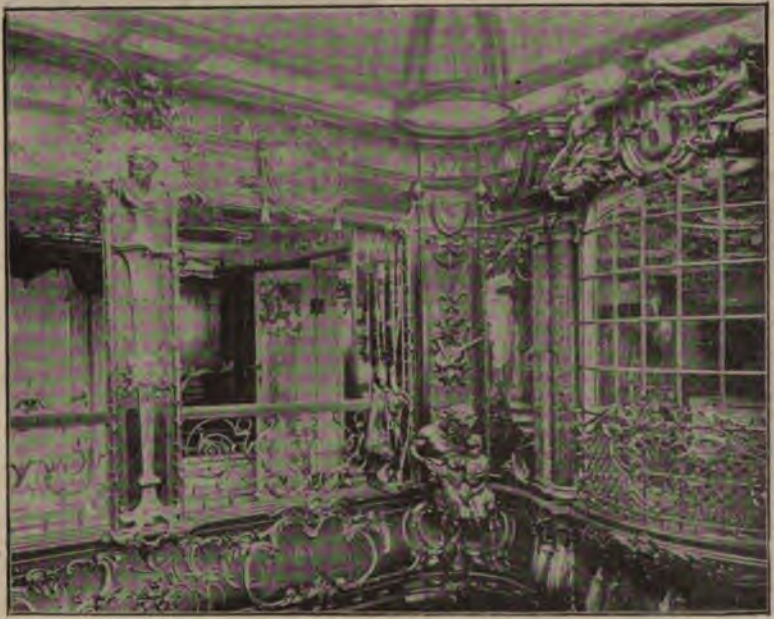
The *D'Entrecasteaux*, a protected cruiser, one of the largest unarmoured vessels of the French Navy, was successfully launched at La Seyne, from the works of the Société de la Méditerranée, on June 11th. This vessel was designed by M. Lagane, and has a displacement of 8,114 metric tons; her length is 393 ft. 8 in.; beam 58 ft. 6 in.; and a mean draught of water of 25 ft. 9 in. To give her the 19 knots speed which it is anticipated she will achieve, she is provided with two vertical triple-expansion engines of 13,500 H.P., steam being supplied to them by cylindrical double-ended boilers. In addition to a bunker capacity of 650 tons of coal, arrangements have been made allowing her to carry and use on occasion liquid fuel. The protection given consists of a belt of 4 in. of steel, and the turrets in which are to be placed the heaviest guns will also be plated with 2·7 in. of the same material. The armament will consist of two 9·4-in. breech-loaders, with twelve 5·5-in. and twelve 1·8-in. quick-firers. Six torpedo tubes are supplied, two of which will be submerged. It may be assumed that this vessel is for use on foreign stations in attendance on a fleet, as she is built of steel and sheathed. She has not the speed of the croiseurs-corsaires, which work up to 23 knots. The date for her delivery and completion is fixed early in 1897.

Navy Records Society.

The third annual meeting of this flourishing society took place on June 11th at the Royal United Service Institution, when Earl Spencer, who is its President, was able to give a most satisfactory report of its condition. The number of members is now 523, and we see among the names those of many distinguished engineers, who thus show their appreciation and interest in Naval history. During the past twelve months the Society has published and issued some particularly interesting and indeed amusing books, throwing considerable light on the social life and manners of the old Navy. Among these may be mentioned "The Life of Captain Stephen Martin" (1666-1740), and "The Journal of Rear-Admiral Bartholomew James" (1752-1827). In these two volumes there are numerous delightfully characteristic sketches of the officers and seamen of the last century. As Earl Spencer said at the meeting, the history of the Navy is the history of the Kingdom, and therefore in producing naval records which had never been previously printed the Society is in reality making a very interesting contribution to the history of the United Kingdom itself. This year it is proposed to issue a couple of books which will give us an insight into life in the Navy in the reigns of Henry VII. and his son, from the "Navy Accounts and Inventories" of the period. For the present the Society's volumes are issued only to members and subscribers, and are not offered for general sale, but a sufficient stock is kept to enable Professor Laughton, the Hon. Secretary, to supply those already issued to new members.

The Engineer in Naval Warfare.

In a recent number of the *North American Review* will be found an enthusiastic "symposium" upon the above subject, which should be interesting to many of our readers. Commodore Melville, Engineer-in-Chief U.S.N., writes:—"If the engineer is not worthy of official recognition, and of some of the emoluments of the naval service, as he stands in that magazine of death, with clear brain and steadfast courage, holding in his firm grasp the heart-strings of the ship, then a new lexicon is required to define his worth. If he falls beneath a maze of wrecked machinery, or within a blast of scalded steam, or sinks to death in the closed compartment, either he dies as heroes die, and his career has been honourable, or the world's ideal needs revision." Much the same argument is used by Mr. Ira Hollis, professor of engineering at Havard College, who points out that there never has been a secretary of the Navy with an insight into mechanical and technical matters, and holds this to be the reason that in a democratic country like the United States it has become necessary for the engineers to make a plea for recognition. Two other articles by Professor Aldrich, of the University of West Virginia, and Mr. Sims, of the American Society of Mechanical Engineers, respectively deal with engineering problems and the repairs of warships after an action. The concluding article is by Mr. George Uhler, who warns the Navy that it cannot expect to recruit its engineering branch largely from the mercantile marine in time of war. Altogether this is a series of particularly instructive papers, which should be widely read and studied as a reflection of the spirit in which the engineering branch of the United States Navy regards its present position.

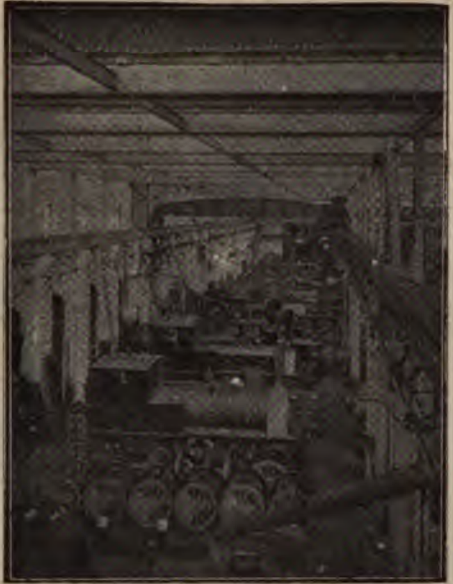


DOME OVER THE SALOON. (*See page* 144.)

Entry of Engineer Students.

The names of the successful candidates who obtained the first twenty-seven places in an open competition examination for studentships in the engineer department of the Royal Navy have been published. These gentlemen, with three holders of service cadetships and seven colonial candidates, will enter the Royal Engineering College at Keyham immediately after the summer holidays, and will date their service seniority from July 1st. The following is the list.—Messrs. Herbert J. T. Jinks, Surrey; F. E. Dean, Sussex; J. A. T. Fielder, Strood; A. V. Sharpe, Malvern Link; J. L. Badham, West Meath; H. V. Whyham, Hants; S. B. Preston, New Brompton; H. W. F. Heneage, Bradford; W. D. Copplestone, Chester; B. Hocken, Plymouth; R. G. Morton, Deal; G. Bevis, Portsmouth; C. R. J. Rundall, Guernsey; H. J. A. White, Basingstoke; H. E. Hoare, Plymouth; W. G. Main, Portsmouth; J. F. Goldsmith, Dublin; A. C. Turnbull, Salisbury; H. Burt, Devonport; J. M. Walker, Cork; H. D. Bishop, Bournemouth; V. G. Le Mesurier, Cork; S. G. Nancarrow, Saltash; J. C. Joughin, Isle of Man; G. F. Coomber, Strood; W. J. Deans, Portsmouth; and R. Walker, Oxford. The examination was held simultaneously in April last in various centres in the United Kingdom. The service candidates are Messrs. A. O'Neil, Plymouth; P. L. Butt, Bristol; and E. Moore, Chatham. The names of the successful Colonial candidates do not appear in the list.

Fig. 1.



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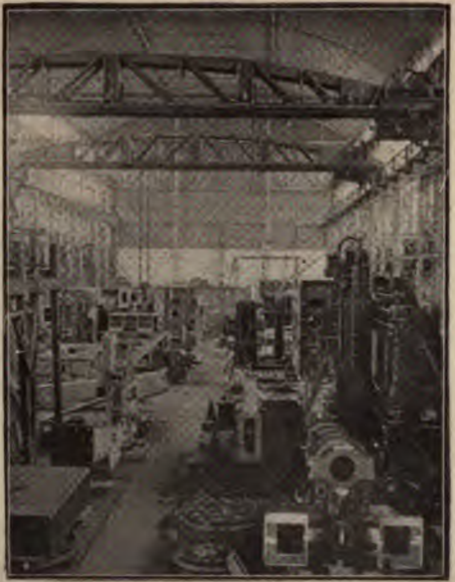

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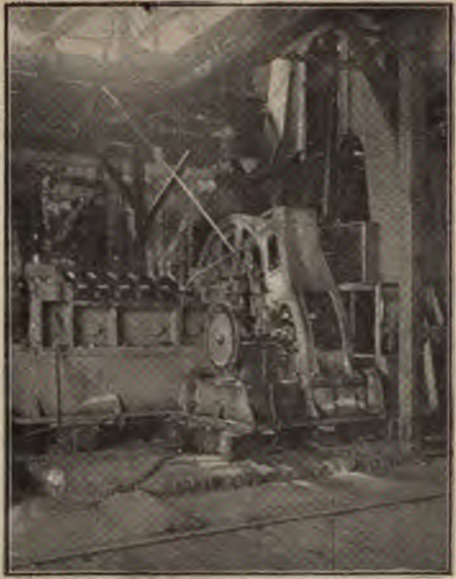

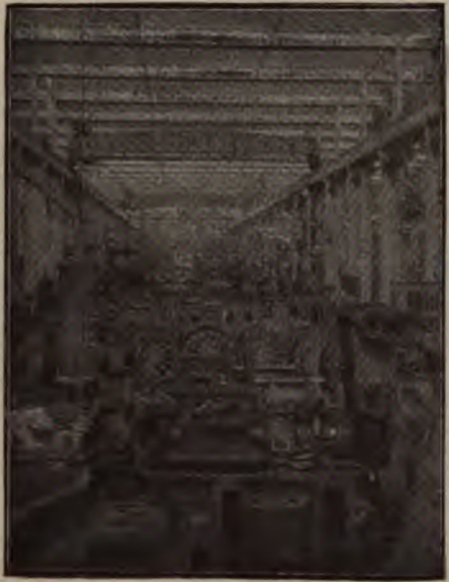

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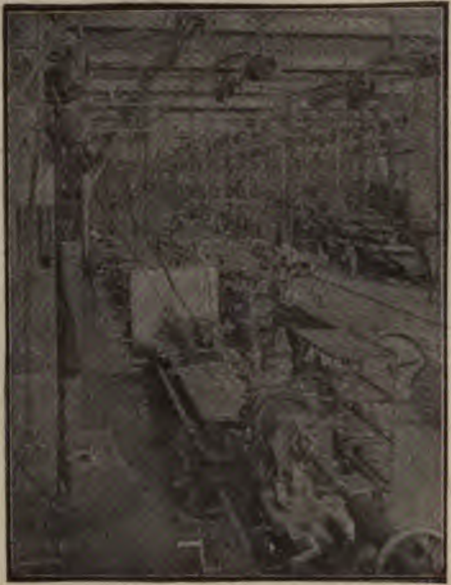

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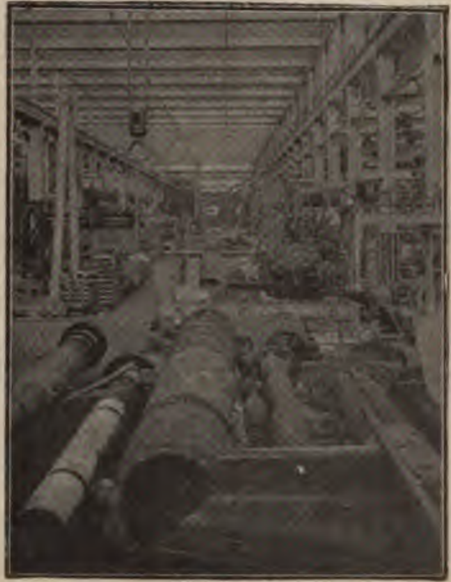
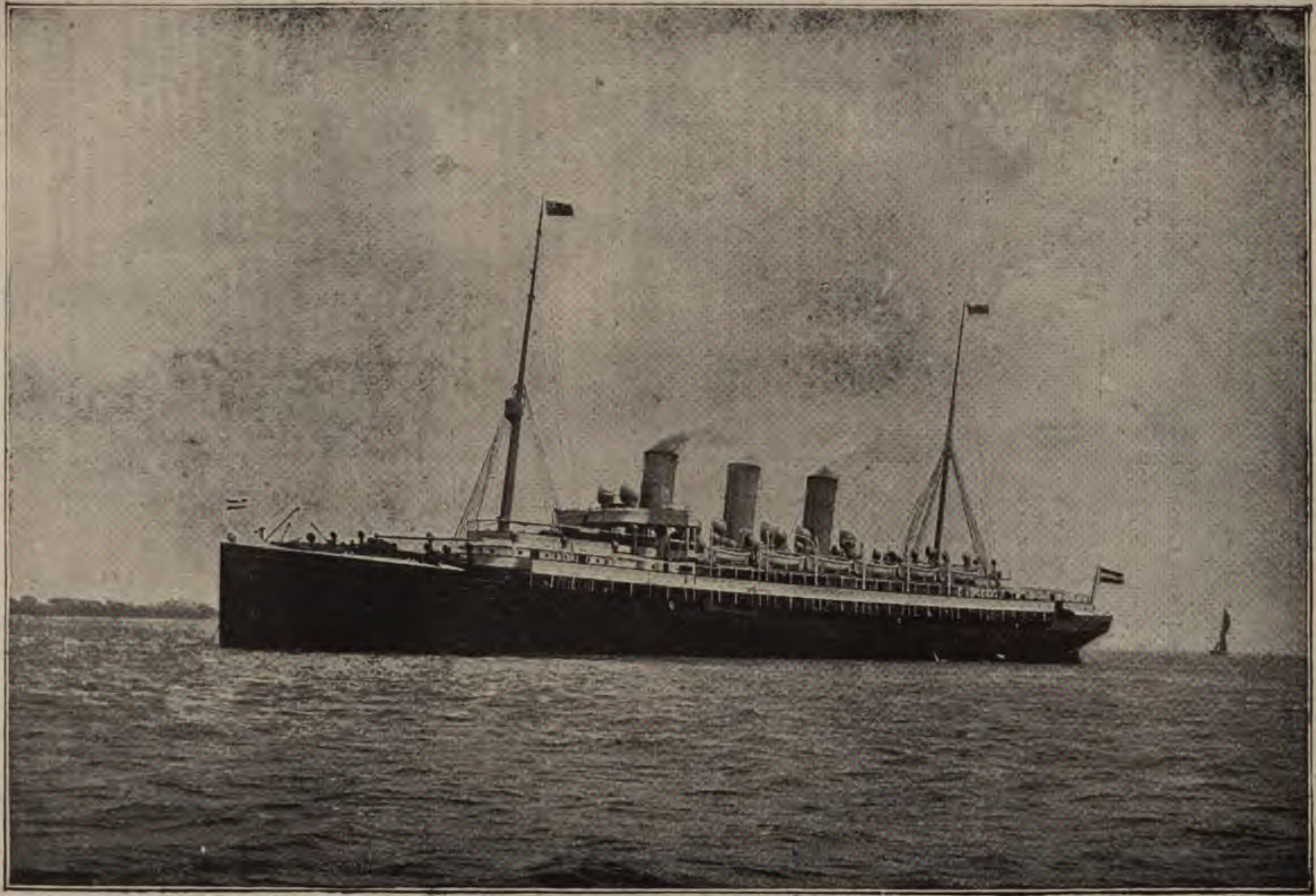


Fig. 6.

VULCAN WORKS, BREDOW, STETTIN. (*See page* 144.)



THE HAMBURG-AMERICAN CO.'S TWIN-SCREW STEAMER, "FURST BISMARCK."

NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from May 27th to June 24th, 1896:—

Amor, Edward R., (probationary) assistant engineer to the *Vivid*, supernumerary, to date July 1st.

Backler, Leonard, engineer to the *Pembroke*, additional for the *Mallard*, undated.

Barry, James H. D., engineer to the *Hawke*, to date June 5th.

Bell, Edwin, engineer to the *Vivid*, to the *Salamander*, to date June 4th.

Bell, Edwin, engineer to the *Wildfire*, additional for the *Landrail*, to date June 20th.

Bell, Henry F., assistant engineer to the *Victory*, supernumerary, to date July 1st.

Brown, Alexander, (probationary) assistant engineer to the *Pembroke*, supernumerary, to date July 1st.

Butcher, John B., engineer to the *Vivid*, additional for the *Earnest*, to date June 20th.

Carlisle, Archibald H., (probationary) assistant engineer to the *Vivid*, supernumerary, to date July 1st.

Chapman, W. P., engineer, has been promoted to the rank of chief engineer in Her Majesty's fleet.

Chapman, William P., chief engineer to the *Rapid*, to date April 11th.

Collins, A. H., (probationary) assistant engineer to the *Pembroke*, supernumerary, to date July 1st.

Croisdale, Louis R., (probationary) assistant engineer to the *Pembroke*, supernumerary, to date July 1st.

Davies, William A. J., engineer to the *Vivid*, supernumerary, to date June 2nd.

Deacon, Alfred E. C., engineer to the *Vivid*, additional for the *Salamander*, to date June 20th.

Dupen, Arthur P. L., assistant engineer for the *Alexandra*, additional for the *Spanker*, to date June 4th.

Edwards, Ernest, engineer to the *Victory*, additional for the *Nymphe*, to date June 2nd.

Green, Donald P., engineer to the *Britannia*, additional, to date June 23rd.

Hammond, Cyril E. J., assistant engineer to the *Vivid*, supernumerary, for disposal, to date June 6th.

Harding, Charles A., assistant engineer to the *Victory*, supernumerary, to date July 1st.

Hare, John S., assistant engineer to the *Wallaroo*, to date June 18th.

Hayes, Henry W., acting engineer to the *Orlando*, to date June 18th.

Howe, Percival C. W., assistant engineer to the *Victory*, supernumerary, to date July 1st.

Howle, Clifford, assistant engineer (temporary) to the *Vulcan*, to date June 5th.

Kenning, Albert J., assistant engineer (temporary) to the *Repulse*, to date June 6th.

Loveridge, Henry J., assistant engineer to the *Victory*, supernumerary, to date July 1st.

Ludlow, G. T. J., engineer, has been promoted to the rank of chief engineer in Her Majesty's fleet.

Ludlow, George T. J., chief engineer to the *Victory*, additional, in charge of reserve stores, to date April 23rd.

May, Walter, engineer to the *Alexandra*, additional for the *Spanker*, to date June 4th.

Meiklejohn, H. J., engineer to the *Zephyr*, to date June 13th.

Michell, W. H., staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet.

Milton, William, staff engineer to the *Victory*, additional for the *Barham*, when paid off, to date July 1st.

Nicholls, Harry E., (probationary) assistant engineer to the *Vivid*, supernumerary, to date June 28th.

Norgate, Robert S. G., staff engineer to the *Northampton*, additional for the *Curaçoa*, to date June 2nd.

Pattison, Alfred R., engineer to the *Pembroke*, for the *Avon*, to date June 19th.

Pearce, Richard H., engineer to the *Edinburgh*, to date June 20th.

Pethick, Ernest E., assistant engineer to the *Vivid*, supernumerary, for disposal, to date June 6th.

Pethick, Ernest E., assistant engineer to the *Majestic*, to date June 19th.

Purkis, Joseph T., staff engineer to the *Victory*, additional for the *Beagle*, to date June 20th.

Reed, W. W., (probationary) assistant engineer to the *Pembroke*, supernumerary, to date July 1st.

Short, Edward A., engineer to the *Victory*, additional, for the *Terrible*, to date June 20th.

Soper, Thomas H., (probationary) assistant engineer to the *Vivid*, supernumerary, to date July 1st.

Wheatley, G. E., engineer to the *Star*, to date June 13th.

Wilshin, John B., (probationary) assistant engineer to the *Vivid*, supernumerary, to date July 1st.

HOAR & BROWN'S HARDWOOD MARKET REPORT, JUNE 22nd, 1896.

TEAK.—	Timber. Loads.	Planks. Loads.	Blocks. Loads.	Total. Loads.
Stock, 1st June	6,253	2,299	74	8,626
Landings	413	347	—	760
	6,666	2,646	74	9,386
Deliveries	409	169	—	578
Stock, 15th June	6,257	2,477	74	8,808

The market still remains firm, and although some very inferior parcels were lately landed, buyers have been found to come forward and pay advanced values to secure them. The deliveries are not so brisk this month, and the stock will again be made up to a fair average quantity by the arrival of a steamer cargo of 4,000 tons shortly expected, which will most probably be placed before H.M. Government for selection under contract.

There are still considerable quantities of cheap wood about, quoted at from £2 to £3 per load under present floating prices, and exercising a lowering influence on the prices of new stock.

The plank trade has suffered by the continued free imports, which are not now placed so readily. Prices are fairly firm, but certainly not advancing. The stock is too heavy and gives the market an unhealthy appearance. Dealers are already forcing their holdings upon the trade at "without reserve" sales, a generally sure indication of weakness.

MAHOGANY.—Although the arrivals have been curtailed and stocks run down to a low point, there is very little excitement or stir, in consequence of the belief that large shipments from various ports are arriving during the next three months. It is rumoured that Africa is sending a steamer cargo, and that Panama is ready to pour consignments into this market, Tecolutta and other southern ports being likewise credited with a desire to take advantage of the present advance in values. Cuba wood is still holding its own although the general demand is slack. The minimum has risen and is now just double what it was last year. Large logs are much wanted and would command a very high price. Tobasco stocks are light, only one cargo being left unsold in shipper's hands, a long price being required for it under private treaty.

Of Cisparta wood the trade decline to take any notice, and Panama turning out so badly of late has caused quite a change of opinion respecting this lately well-spoken-of class of wood. Should the inferior quality continue to be shipped this wood will, like Cisparta, soon hold no class at all.

CEDAR.—Enquiries just now for the genuine article have quite disappeared, owing to advanced prices, and to large shipments from Paraguay being placed upon the market at low figures.

WALNUT.—Logs are keeping fairly firm in price, although the demand has become somewhat light during the past few weeks. Lumber is selling well for first class goods, but the lower grades are difficult to dispose of at a profit to the shipper.

WHITEWOOD.—Logs are not much enquired for, and lumber is fetching full prices.

GREENHEART.—Very little moving in logs. There have been some enquiries for specially prepared parcels. Stocks are getting lighter, but trade being so very dull this will not interfere with values.

KAWRIE PINE.—A cargo is expected very shortly, when with such an increased supply there may be a slight reduction in prices. Business is fairly active while the goods can be had at fair values.

SEQUOIA.—Stocks are rapidly decreasing and no fresh arrivals are expected yet. Quotations continue low and enquiries are numerous.

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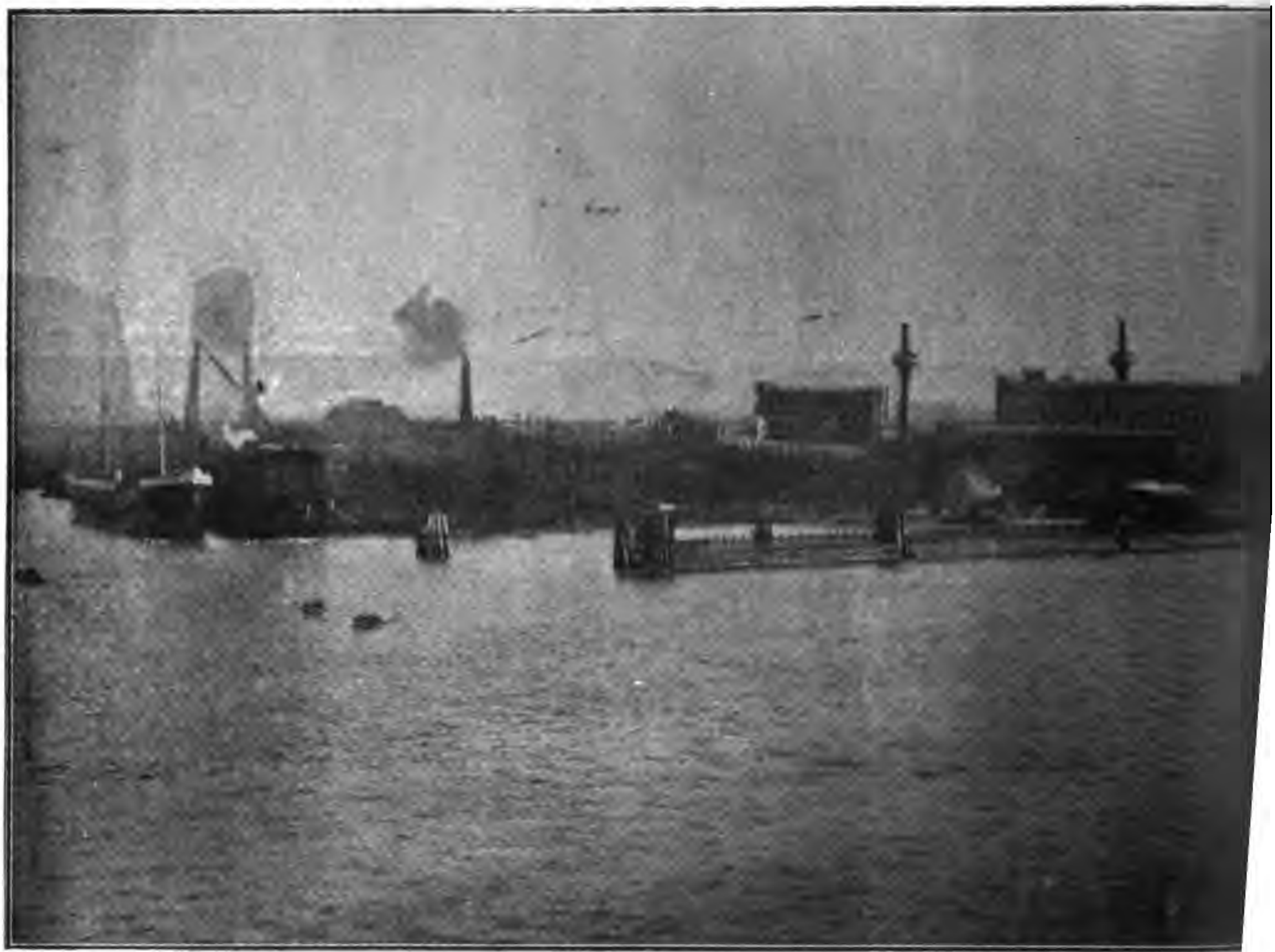

SHIPBUILDING AND ENGINEERING W

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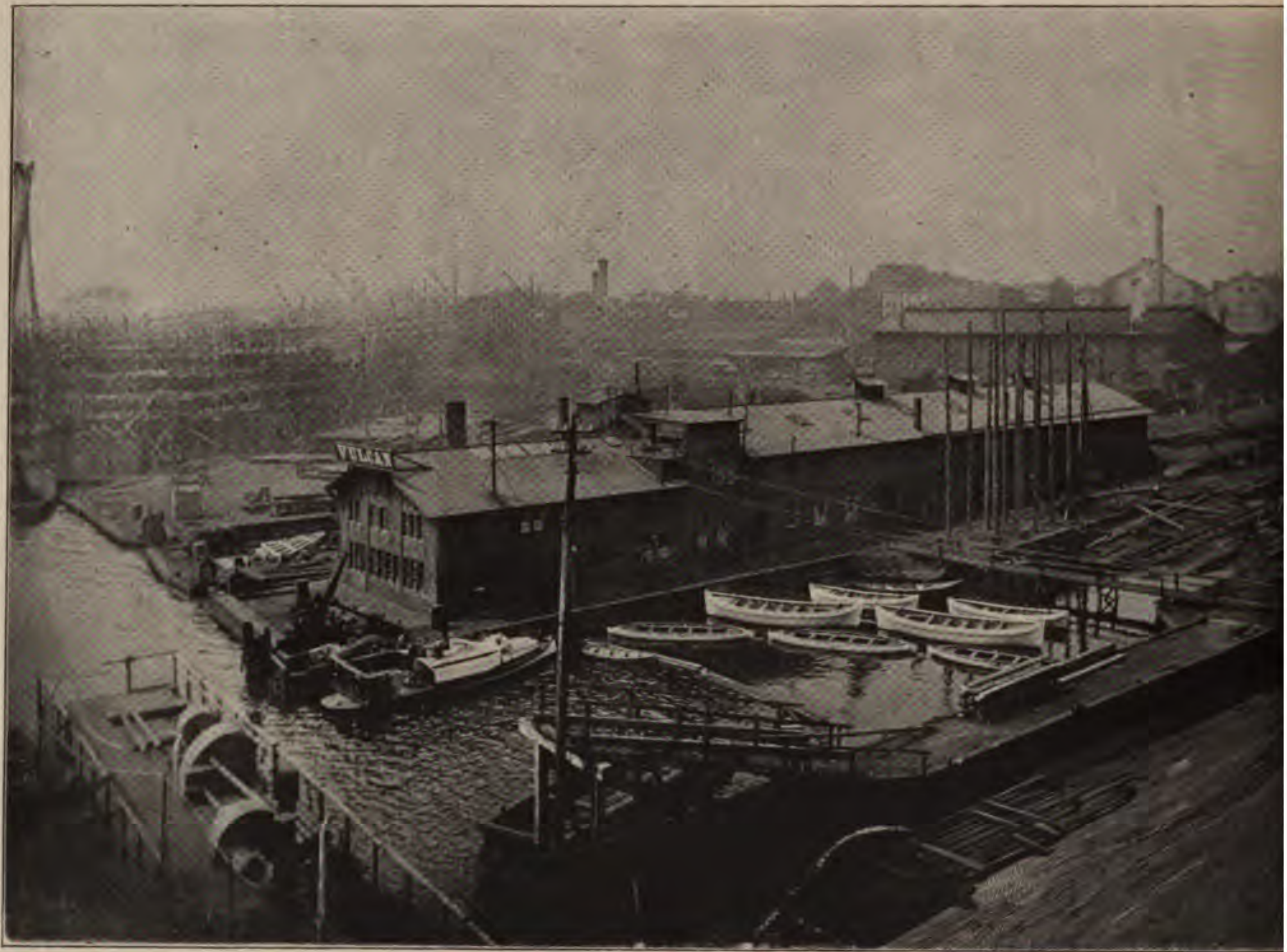
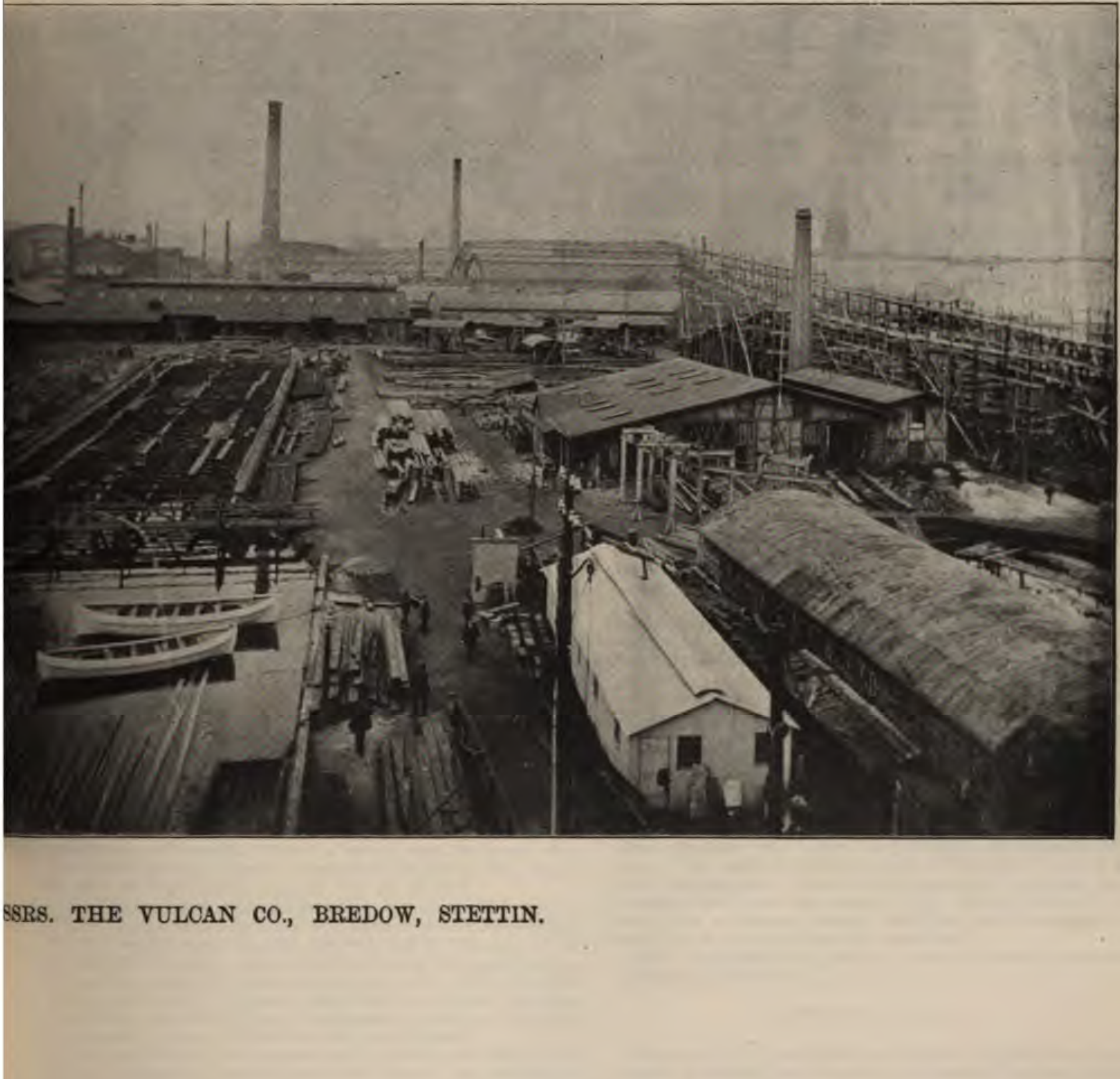


SHIPBUILDING AND ENGINEERING WORKS



SSRS. THE VULCAN CO., BREDOW, STETTIN.

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ASTOR, LENOX AND
TILDEN FOUNDATIONS.

PADOUK.—The sales have been limited, except at great reductions in price, and in these circumstances some inferior qualities have changed hands.

Business has been very much quieter, owing to the approach of the end of the half-year, when many firms take stock.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(From our own Correspondent.)

THE Clyde engineers have during June been balloting on the offer made by the masters some time ago, the various branches being engaged at meetings especially called for that purpose. A meeting of the committee was held in the central rooms, Glasgow, at which the aggregate vote was counted, and found to be, by a considerable majority, in favour of acceptance. Various statements as to the exact figures were made, but the official information given was to the effect that about two-thirds of the men in the district had voted, that the majority was quite sufficient for all practical purposes, and that it could be safely said that the men had accepted the offered terms. The fact that the offer has been accepted is, however, sufficient, and ensures six months of, at least, comparative quiet in the Clyde and Belfast engineering trade.

The executive of the Paisley district engineers have accepted the offer of the employers, which was sent last month to the officials of the A.S.E. in London, Glasgow, Greenock, Paisley and Belfast. In their communication the employers offered an advance of ¼d. per hour, or 1s. per week, the advance to date from June 12th. It was unanimously agreed to accept the advance, the rate as applied to Paisley being 1s. per week, the advance to hold good for six months. This will bring the wages in Paisley district up to 32s. weekly.

On June 23rd a general meeting of the Airdrie engineers on strike was held. Mr. Ferguson, on behalf of the Amalgamated Society of Engineers, reported that, on the invitation of Messrs. Gibb & Hogg and Messrs. Inglis & Co., he had waited on these firms in regard to a settlement. The men's demand is for 2s. of an advance per week and time and half for overtime. The firms referred to had offered a shilling advance all over and time and half for overtime. Mr. Ferguson, however, had indicated to the employers that there was little likelihood of the men accepting these terms, seeing that the full advance had been given in other shops in the district, and that several of the strikers had accepted employment elsewhere on the full advance. The meeting decided to accept nothing less than 2s. per week advance for all men earning 29s., and 1s. for those earning above 29s., with time and half for overtime in each case. The number of men on strike originally was 85, and with the number who have received employment elsewhere the number of strikers is now 45, while 40 are working. The men declare that unless the advance is given by the end of the week the other men at work will be brought out on strike.

The Airdrie Iron Co., only a few of whose engineers have been on strike, have posted a notice on their works intimating that in future pattern-makers, engineers, blacksmiths and boiler-makers will be paid time and half for overtime, instead of time and quarter as at present. About a month ago the same firm voluntarily gave an advance of wages in respect to the general increase of wages taking place all over the country.

In Dundee some misunderstanding has occurred in various engineering yards in connection with a promised increase of wages. Several months ago a dispute occurred, and at that time 1s. of an advance in wages was granted to turners and machinemen, intimation being also given that another 1s. would be conceded during last month. The men assert that an increase has been granted to members of the Amalgamated Society, and a strike has resulted, several of the foundries being affected.

The labourers in the employment of the Lanarkshire Steel Co., at Motherwell, struck work last month for an advance in wages. The men demand an increase from the present rate of 18s. per week to £1 per week. Over 100 men are affected, and they seem determined on holding out.

Mr. Peter M'Lean, of Roseneath, has half-a-dozen boats under construction for the steam yacht *Varuna*, building in the yard of Messrs. A. & J. Inglis. The principal boat is a gig 30 ft. long, while the others are a cutter, long boat, whale boat, and a pair of dinghies. The boats are planked in yellow pine, each plank has been put in in one length, thus obviating the necessity of scarfing. A handsome 26 ft. gig is being built for the steam yacht *Fire Fay*, belonging to Mr. James Stevenson, of Haylie, Largs.

Messrs. The Fairfield Shipbuilding Co., of Govan, have secured an order from the Isle of Man Steam Packet Co. to build a new paddle steamer, which in size, speed, and appointment, will, it is stated, eclipse any paddle steamer afloat. She is to be 360 ft. in length, and 42 ft. in breadth, while her H.P. will be 10,000. She will have four decks, the topmost of which is to be a shelter deck. The accommodation will be for 2,000 passengers. Her engines will be triple-expansion of compound horizontal diagonal type. The new steamer will be on similar lines to *La Marquerite*, and is to be put on the Liverpool and Douglas station during the early summer of next year.

Messrs. Russell & Co., shipbuilders, Port-Glasgow, have contracted to build a steel twin-screw steamer for passenger and cargo service on the River Amazon, and is similar in design to several already built by them.

Messrs. A. Stephen & Sons, Linthouse, have contracted to build a screw steamer of about 2,800 tons gross for Mr. A. C. Le Quellec, of Bordeaux.

Messrs. Wm. Denny & Brothers, Dumbarton, have booked an order for a passenger vessel, of large accommodation and high speed, from the Union Steamship Co. of New Zealand.

Messrs. Murdoch & Murray, shipbuilders, Port-Glasgow, have received an order to build a steel screw passenger steamer for service on the River Amazon. Triple-expansion engines will be supplied by Messrs. Lees, Anderson & Co., Glasgow. This is the third Amazon steamer Messrs. Murdoch & Murray have booked lately, and they are also laying down the keels of two paddle-steamers.

Messrs. Wm. Simons & Co., Limited, Renfrew, have received an order for a powerful twin-screw sand pump hopper dredger, of 1,000 tons capacity, from the East London Harbour Board, South Africa. The vessel will be fitted with special arrangements for dredging the bar at East London.

Messrs. Blackwood & Gordon, engineers and shipbuilders, Port-Glasgow, have secured an order from Messrs. Alex. A. Laird & Co., Glasgow, for a steel screw steamer to register 600 tons gross, and to have engines of 900 H.P. She will be fitted throughout with cattle pens of the most improved description, and will have a saloon aft for first-class passengers. She is intended for the Messrs. Laird's cross-channel traffic between Scotch, English, and Irish ports.

Messrs. M'Knight & Co., Ayr, have contracted to build for the Corporation of the Burgh of Renfrew, a large powerful ferry-boat, to be employed in the cross-ferry traffic between Renfrew and the Clydebank side. She will be constructed on the most improved principle, and will be capable of carrying 400 passengers. The machinery will be supplied by Messrs. Lees, Anderson & Co., Glasgow. She will be supplied with diagonal engines and double chains for additional security against the heavy currents which sometimes prevail on the Clyde.

Messrs. Hawthorns & Co., Limited, Leith, have received orders for the construction of a powerful steam yacht and another screw steam trawler.

Messrs. Robert Stephenson & Co. have received from the Clyde trustees an order for a pair of massive dock gates. The work of building them will be carried out at the firm's Hebburn yard, where several contracts of a similar kind, including dock gates and caisson for the Barry Railway Co. at Barry, and a floating pontoon dock for the Corporation of Bristol, have been satisfactorily completed.

Clyde shipbuilders have sent in tenders for large-sized steamers aggregating 45,500 tons.

"Slaney."—On June 23rd the Hopper dredger *Slaney*, constructed by Messrs. Wm. Simons & Co., Limited, Renfrew, for the Wexford Harbour Commissioners, underwent its steaming and dredging trials with very satisfactory results. The dredging trial took place at Greenock. The vessel after being loaded was run over the measured distance at Gareloch, with a result that a speed in excess of the amount stipulated in the contract was obtained, and thereafter proceeded to Wexford.

TRADE NOTES FROM THE TYNE, WEAR, TEES, HARTLEPOOLS, &c.

(From our own Correspondent.)

THE TYNE.

Shipbuilding.—In connection with the shipbuilding industry business has continued quiet during the past month, enquiries being few and new contracts scarce. The rise in prices resulting from advanced wages rates, &c., appears still to exercise a restraining effect upon enterprise, and the disposition to "hold off" until easier terms can be secured from builders, still seems to be rife among shipowners. There are, of course, other causes, and perhaps more potent ones, that are tending to make holders of shipping property somewhat cautious about acquiring further responsibilities at the present moment. Be this as it may, we can only state the opinion that any decline in the prices of tonnage is not to be expected in the immediate future, nor indeed for a considerable time to come, as a further advance of wages is to take place in September, and the prices of material are also on the upward grade. Instead of a decline, it may reasonably be expected that a further rise in shipbuilders' quotations will become inevitable towards the close of the year, if not sooner, and it would be wise on the part of those who contemplate investing in new tonnage to carry out their purpose without delay.

Though there has been little doing in the ordering of new ships lately, quite a number of old vessels have changed hands, the new proprietors being in most cases foreigners. The number of British vessels transferred to foreign flags during the six months of the year that have elapsed is 173, representing an aggregate carrying capacity of 132,195 tons. About one-third of the vessels transferred were sailing craft, and of the other two-thirds a very large proportion formerly belonged to owners in northern ports.

We have reason to believe that the expectation which has so long been entertained with regard to Japan ordering largely from English and Scotch shipbuilders, is close on fulfilment, and that a commission of agents, representing a Japanese syndicate, are now engaged in making enquiries with regard to relative cost of production, capabilities of despatch, and other matters, at the different shipbuilding centres of the United Kingdom. These enquiries are being made in respect of merchant ships; but it is understood that negotiations have also been entered upon with several leading firms for the building of cruisers and other classes of warships.

The keel for a cruiser of the very largest class is now being put down at the Elswick yard of Messrs. Armstrong, Mitchell & Co., making the fifth war vessel in course of construction on the stocks, besides an equal number that are being fitted out in the water. There are also in progress a pair of huge dock gates for a large graving dock at Buenos Ayres. These will be sent out in sections (for convenience of transit) and will be reconstructed and rivetted at the port of destination. In addition to two Norwegian cruisers that are being built at the company's Low Walker yard, it has been decided to put down at the latter establishment a third war vessel, of exceptionally large dimensions. This vessel will occupy two large building berths, and on account of its great length, is being laid down diagonally. There is also in course of construction at the Low Walker yard, a railway ferry steamer for Russia. This is the second vessel of the kind built at the yard, but it is by many degrees larger and more powerful than the former one. The neighbouring yard of Messrs. Dobson & Co. is well-supplied with work, one of the vessels on the stocks being of large dimensions.

Messrs. C. S. Swan & Hunter have all their berths filled, the vessels building in the east yard, where the new covering sheds are situated, being of a specially large and expensive class. It must be obvious that in the case of superior vessels having wood decks and other accessories of the same material, in structural combination with steel or iron, their being built under cover is a most important consideration, involving as it does protection from wet, and the corrosive action which sometimes ensues. It also admits of the work being gone on with uninterruptedly, which is a further help towards the attainment of structural soundness, besides being of importance as securing rapid execution. The large pontoon dock for the Smith's Dock Co., North Shields, which was launched early in April, is still beside the yard, where a few weeks ago the splendid meat-carrying steamer *Leitrim*, ordered by Messrs. Hudson, of Sunderland, was fitted and completed.

Messrs. Wigham Richardson & Co. have a good supply of work in hand, among recent contracts being an order for two passenger-cargo boats, from a newly-established continental partnership. These will approximate to the style of the *Adria* boats, with which the firm's name is so intimately associated, but we believe they will be somewhat larger. It is reported that the firm have within the past few days booked an order for two large steamers of a special type.

The Palmer Shipbuilding & Iron Co. are now having a good show of work in their Howdon as well as in their Jarrow yard, and the resources of their repairing department are also fully engaged. The yard of Messrs. Hawthorn, Leslie & Co. maintains a brisk appearance, and at the Tyne Shipbuilding Co.'s yard business is still brisk. Messrs. R. Stephenson & Co. have received from the Clyde trustees an order for a pair of massive dock gates, and, in the absence of shipbuilding work, this will help to keep the machinery going. The yard of Messrs. John Readhead & Sons is still full of work, and at the quay the fine steamer *Trojan Prince* is being fitted out. The repairing department is kept fairly busy, and at many of the other repairing establishments in the locality considerable briskness exists.

Engineering.—The state of business in most of the large engineering establishments is still good, the Government work contributing largely to this satisfactory condition of affairs. There has been despatched from the works of Messrs. Black, Hawthorn & Co. this month a quantity of locomotive work in sections for shipment to Russia. The cases were addressed to His Majesty Alexander III. at Libau, in care of the chief constructor. A report is current that this establishment is shortly to close, but the statement has not been verified, and though some change in the constitution of the firm appears to be imminent, there is still a prospect that it will not be the regrettable one which involves a cessation of operations.

Messrs. Noble & Lund, Felling-on-Tyne, have decided to double the size of their present works, and have already taken the initiatory steps for the carrying out of that project. The pressure upon their productive resources has been exceedingly heavy lately, and extension had consequently become imperatively necessary. The contemplated addition to the premises will enable them to increase their productive capacity at least 100 per cent., and it is believed that this increase will not be in excess of requirements. The department of the works in which Mudd's patent packing rings (of which the firm are the sole licensees) are manufactured is busier than at any time since the firm took up the making of this speciality, and the influx of business in this line is steadily on the increase. This is scarcely to be wondered at considering the effectiveness of these rings in work, and to show how they are gaining in popularity, it need only be said that orders from leading engineering firms for several sets at a time, have recently been booked. The rings are specially adapted for modern high pressures, and it may be added that those manufactured at the works of Messrs. Noble & Lund are precisely similar in design to the rings used in the engines of the five-crank steamer *Inchmona*, which can be worked to a pressure of 250 lbs. The firm have in hand in another department a large lathe for turning locomotive wheels up to 8 ft. in diameter, ordered by Messrs. Jessop & Co., of Sheffield. Two of these wheels, it may be stated, can be placed on the lathe and turned simultaneously. The firm have also a band saw, for cutting iron and steel cold, in hand for Messrs. Jessop. This machine is of the special type made at the Felling Works, but is 50 per cent. larger than any hitherto turned out. They have also in hand a splendid equipment of machinery for a new electrical and general engineering works about to be started in a northern county, besides a number of orders for lathes, drilling machines, band-saws, &c., from distant centres in this country and abroad.

Messrs. Ernest Scott & Mountain, Limited, have made a further addition to their works by the incorporation of a large six-storey building, which provides space for an electrical erecting shop, a pattern-making department, and a store-room for spare patterns, &c. The portions of the works which have hitherto been used for the purposes indicated, will now be devoted to other uses, and a very large increase of productive capacity is expected to result. The firm are at present exceedingly busy, and it is understood that some important new contracts are in negotiation.

Messrs. Emerson, Walker & Thompson Bros., Dunston, continue to be busy on orders for the deck machinery of important vessels in course of construction at the principal shipbuilding centres. The firm have recently fulfilled a large order for deck machinery of a rather exceptional kind, and have been completely successful in meeting the special requirements of the case. In the forge department the firm have also an abundance of work, the orders for stern frames and other descriptions of ship and engine forgings being very numerous.

Blyth.—The new coal shipping staithes at this rising port have been brought into operation, and a greatly increased shipment of the mineral has resulted. The Blyth Dry Dock Co. have shown great confidence in the future of the port by undertaking the construction of a third dry dock, which is to be of considerably larger dimensions than either of the two already owned by them. The new dock will be capable of accommodating vessels of the very largest class, and as the company contemplate putting down additional machinery of the most effective kind, their enterprise is likely to contribute in a very material sense to the further development of Blyth. The new dock, it may be stated, is now in course of construction, and the work is being pushed forward with all possible despatch.

THE WEAR.

Shipbuilding.—The North Sands Yard (Messrs. J. L. Thompson & Sons), still maintains a leading position in point of briskness as well as in other respects. If the firm only launch half as much tonnage in the second half of the year as they have done in the first half, their yard will this year have a record output, not only as regards the Wear, but probably the whole north-east coast. Were they to equal the first six months' production in the next six months—which is not likely—they would in all likelihood, top the world's record of output for 1896.

The report is current that at Mr. Laing's yard, Deptford, a steamer of 10,000 tons carrying capacity is about to be laid down. The firm have a very important repair contract, in the restoration of a large part of the shell as well as a corresponding portion of the internal fittings of the s.s. *Clydesdale.* The vessel had been ashore in a position of great difficulty near Whitby; but she was ultimately got off in a condition which admitted of her being taken to Sunderland after some slight repairs of a temporary nature had been effected.

Messrs. Robert Thompson & Sons have booked additional orders, and the yard is now likely to be kept pretty busy until the winter. Messrs. Short Brothers are also well supplied, and at Messrs. Doxford's and Messrs. Priestman's business is fairly brisk. Some of the other yards are moderately busy; but in a few cases real slackness exists.

Engineering.—At the Palmer's Hill Engine Works (Messrs. John Dickinson & Sons) and also at the Southwick Engine Works (Messrs. George Clark, Limited) there is a substantial increase of work, and in both cases the pattern-makers are very busy. At the North-Eastern Works business has also improved, and this remark applies, though perhaps in a less degree, to the other engineering works in the district.

The "Improved Stern Tube," patented by Mr. J. W. Donovan, consulting engineer, 3, Norfolk Street, Sunderland, has been fitted in a new steamer just engined by Messrs. Dickinson. The vessel belongs to local owners, and this is the second for which they have specified Donovan's tube.

A new type of water-tube boiler has been patented by a Sunderland gentleman, connected with shipping in the capacity of superintending engineer. The boiler seems to have the desirable combination of structural simplicity and effectiveness in work, and we hope to be able to give fuller particulars relating to it in a future number. Another Sunderland gentleman has patented a new furnace door, which is specially applicable to marine furnaces. Of this speciality we also hope to give full particulars on a future occasion.

Mr. Wm. Mills, the well-known local inventor, has begun to apply the new metal, aluminium, to a variety of purposes for which it was hitherto thought to be unsuitable. In his brass and copper works he has had ample opportunity for experiment and research, and of this he has taken full advantage, with the result that he is now in a position to give his ideas practical application. The most interesting application of the metal that has yet taken place was the manufacture—or rather the casting—of an electric engine bed, which was despatched from the works on a recent date. The casting weighed 1½ cwt., and was exactly one-third the weight of an iron casting of equal size. Mr. Mills' investigations are eminently practical, and so far appear to have resulted in very gratifying success.

The Hartlepools.—A new graving dock, the construction of which was commenced a couple of years ago by Messrs. Furness, Withey & Co., at their Middleton shipyard, was formally opened on the 20th inst. The dock, being a tidal one, can be entered from the harbour, and even at neap tides will have sufficient water to admit of docking or undocking vessels without accident. In proximity to the dock an engine-repairing shop 400 ft. long has been erected, and at its head is placed a crane 80 ft. in height, and capable of lifting that number of tons. This crane can be worked by one man, electricity being the motive power employed in this case as throughout the whole establishment. It may be added that the working arrangements and productive appliances of the yard have been almost completely remodelled during the past couple of years. The s.s. *City of Rotterdam* was the first vessel that entered the dock.

It is understood that Messrs. Irvine & Co., whose building berths have been unoccupied for some time, have booked an order for a good-sized steamer, the construction of which will be commenced immediately. Though the firm have had no new work lately, they have not been without a fair share of repair work, and employment was consequently provided for a number of the hands.

The steel works have been very busy lately, and at the local engineering works business has been fairly active. Trade at the docks is now quite brisk, the imports of timber being unusually heavy.

Stockton.—In the shipbuilding yards trade is moderately good, and in the engineering establishments an improvement is noticeable. Boiler works and forges are well employed, and in the steel works activity is the rule. The annual report just issued by Messrs. Head, Wrightson & Co., shows a gross profit for the year (with £249 8s. 6d. from last year) of £15,716 19s. 7d., which, after deducting £5,122 1s. for interest on debentures, and £5,166 13s. 4d. for direction and management charges, leaves £5,250 for division among the shareholders, and a small amount to be carried forward to next year's account. The firm have a good many contracts in hand, and though prices are not so satisfactory as could be wished, the realisation of a fair profit on the year's working is anticipated. With a view to expedite the execution of contracts, the firm have decided to temporarily acquire the use of a large foundry in the vicinity. The business of the firm, it may be added, consists mainly of general engineering, ironfounding, and bridge building.

Middlesbro'.—It is understood that Messrs. Raylton Dixon & Co. have secured another order for a vessel of similar dimensions to the Hamburg South American boats, which the firm are building, and they have also secured a fair amount of repair work. Messrs. Craggs & Sons continue fairly well employed and have a handsome paddle-wheel steamer ready for launching. Steel works at this centre are busy, ship plates being £5 per ton, and angles £4 17s. 6d. Engineering works are tolerably brisk, and foundries are on the whole kept going steadily. Owing principally to an improvement in timber imports, business at the docks is brisk

Darlington.—Waggon works at this centre are kept in steady operation, but other local industries are slack. An exception, however, is shown by the state of affairs at the Darlington Forge Co.'s works, where orders are still abundant, and operations are carried on—in most departments—night and day.

THE MERSEY.

(From our own Correspondent.)

THE position as regards the shipbuilding, marine and general engineering trades of this district continues one of exceptional activity. Engineers are generally better employed than they have been for many years past, and not only is the home trade fairly satisfactory, but several large orders for abroad have been secured during the past month. The iron trade also shows a decided improvement upon the slow tone which has prevailed for the last month or two. The supplies of both raw and finished material, however, continue more than ample to meet the demand, owing largely to the absence of foreign business, and considering the exceptional briskness in all branches of the iron-using industries, the prices realised are far below what might be expected.

With regard to the shipbuilding yards on the Mersey, there is nothing very special to report. Messrs. Laird Bros. continue busy on Government and general orders, and are making rapid progress with the torpedo-boat destroyers which they have in hand. On June 13th the firm launched from their Birkenhead works the *Guardia Marina Riquelme*, which is the last of the four 30-knot torpedo destroyers that the firm have built for the Chilian Government. It may be added that the above vessel is the eighth 30-knot destroyer launched by the firm during the last nine months.

In the general engineering industries the position continues very satisfactory, establishments all through being exceedingly busy, and in many cases having orders in hand to carry them on for some time to come. Machine tool makers are all exceptionally well employed, stationary engine builders continue very busy, and boiler-makers and general engineers have all a considerable amount of work in hand, with a very favourable outlook for the future. Locomotive builders have also been booking considerable orders recently. This exceptional activity is bringing the wages question to the front, and movements for an advance on the part of several sections of the workmen are in progress, but there is no really general agitation, and the above cases are as yet pending the expiration of the notices under the consideration of the Employers' Association.

The monthly returns of the principal engineering trades unions show very little change as regards the number of members on out-of-work support. The Amalgamated Society of Engineers reports about 2½ per cent. of its total membership on support, which would however no doubt have been considerably reduced but for the large number of men temporarily suspended during the past month, owing to the Whitsuntide holidays. In this immediate district there has been a further substantial reduction in the unemployed list, which now represents only ¾ per cent. of the local membership, which indicates a state of trade more satisfactory than has been the case for several years past. It may be added that the Amalgamated Society of Engineers continues to make rapid progress as regards membership, 3,575 admissions having been made since the commencement of 1896, and the total now reaches 82,709. The Steam Engine Makers' Society's returns show a slight decrease in the out-of-work list, only ¾ per cent. being now on donation benefit. Reports received from the various districts as to the state of trade continue generally very favourable, practically all departments being very actively engaged, and it is only in isolated cases where the position is not reported as satisfactory.

In connection with the extension of the Manchester Corporation Electric Lighting Installation, Mr. Benjamin Goodfellow, of Hyde, is just completing the contract for the engines, some of which have already been supplied. The order includes eight engines, six of which are vertical and two horizontal, and all of them are fitted with Corliss valves, which, it is stated, are found to be an improvement upon the slide valves adopted in the engines that have been working for some time at the electric lighting works.

Messrs. Nasmyth, Wilson, of Patricroft, have in hand an exceptionally powerful press for special material, to work at a pressure of five tons per square inch, and which is to be sent out to India. Amongst other special orders which the firm are completing is a large hydraulic press, weighing 180 tons, for dealing with Egyptian cotton, which, by the combined powers of water and steam, is capable of turning out 60 bales per hour. They are also well engaged in executing orders for their well-known steam stamps, which are now largely used by makers of bicycle forgings. In their locomotive department, Messrs. Nasmyth, Wilson also continue very busy, and have recently been securing considerable orders in connection with the Japanese railways.

An improved bending machine, for dealing with the wrought iron spokes of railway carriage and waggon wheels, has just been completed by Messrs. Cunliffe & Croom, Manchester. This machine, amongst other special features, has an attachment for automatically raising the spokes out of the dies after being bent and blocked. The driving arrangements consist of an engine attached to the machine, the stopping and starting being regulated by means of friction cones, which are instantaneous in operation, and render the stopping and starting of the steam engine unnecessary, whilst removing any risk of breakage to the machine. The machine is constructed with exceptionally powerful gearing, and the strength of the apparatus as a whole has been considerably increased, as compared with former designs, with the result that the largest size thickened-back spokes now in use can be bent at the rate of six per minute, and blocked effectually to the exact shape required. The firm have also other special work in hand, including cycle-making machine tools, and also tools for making the motors used for horseless vehicles.

Mr. James Hodgkinson, of Salford, Manchester, has recently been engaged in improving and perfecting the design of his patent steam generator and superheater. Essentially the generator consists of a coil of pipes, placed in the bottom or back flue at the end of the boiler, or in both positions conjointly in the case of Lancashire or Cornish boilers, whilst they may be placed in any suitable position in water-tube or other marine boilers. The pipes can be made of more than one length, and joined by a special coupling, or, if desired, of one length without joints, and expanded into headers or box-ends. In the improved design, the joints of the pipes have been considerably strengthened, whilst a better material is used in the making of the tubes, and the difficulties experienced in the early stages in connection with the feeding of the pipes have been entirely overcome by the introduction of an improved method of performing this operation. The apparatus may be used as a circulator, superheater, auxiliary boiler, or precipitator, and it is claimed that it will raise 20 per cent. more steam than the most modern Lancashire boiler, with the same amount of coal, even when the latter is fitted with the most approved type of economisers. The firm has also made several improvements in their mechanical coking stoker, in which springs and shovels are entirely dispensed with, the coal after passing from the hoppers on to a plate, being pushed by a box ram on to a coking shelf, which also acts as a distributor. The bars are worked by triple cams, driven by a steel hexagonal shaft, and carrying the coal with them to the back, until the residue drops into a pit behind the fire-bars. The stoker is absolutely automatic in working, secures a perfectly smokeless chimney, and has less parts to get out of order than any other make, whilst coal ordinarily rejected as useless for boiler firing can be utilised, one large colliery having saved 50 per cent. in this direction by the use of this stoker, combined with the generator already described.

The iron trade has shown a decided improvement during the past month. An increased weight of business has been put through in most quarters, whilst there has been an upward move in makers' prices, although underselling still goes on amongst merchants and dealers. In pig-iron local makers are firm at 46s. 6d. less 2½ for No. 3 foundry, whilst they are also stronger as regards forge qualities, owing to the less keen competition of Lincolnshire iron. In district brands Lincolnshire forge has been twice advanced to the extent of 6d. per ton, and is now quoted 41s. 6d., with foundry firm at 43s. net cash; Derbyshire foundry is also higher, 46s. up to 47s. according to brand being now the average figures for delivery Manchester. As regards outside brands, Middlesbrough has hardened up about 6d. per ton, 45s. 10d. to 46s. 4d. net cash, being now the minimum delivered by rail, Manchester, 44s. Manchester Docks, whilst Scotch iron is also stronger, Eglington averaging 46s. 3d. to 46s. 6d., and Glengarnock 47s. to 47s. 6d., net prompt cash, delivered Lancashire ports, and 2s. 3d. above these figures at the Manchester Docks.

In the finished iron trade an improved tone is noticeable generally. Lancashire bars are not quoted under £5 10s. to £5 12s. 6d., and North Staffordshire £5 12s. 6d. to £5 15s. Sheets have shown a substantial upward movement, and could scarcely now be bought under £7 5s., while hoops are firm at £6 2s. 6d. for random to £6 7s. 6d. for special cut lengths, delivered Manchester district, with 2s. 6d, less for shipment.

The steel trade remains in much the same position as last reported, although prices are lower, if anything. Hematites are firm at 57s. 6d., to 58s. less 2½, and billets £4 7s. 6d. net cash; but Lancashire steel bars could be bought under £6, and boiler plates do not average more than £6 5s. delivered in this district.

In the metal market there has been a brisk demand all through the month, and this, combined with the upward movement in raw material, has led to advances representing ½d. per lb. on brass and copper manufactured goods, list rates, for delivery in this district, being now as under:—Solid drawn brass boiler-tubes, 7d.; solid drawn brass surface condenser tubes, 8½d.; solid drawn copper tubes, 8½d.; brazed copper gas and steam tubes, 8¼d.; brazed brass gas tubes, 7¾d.; brass wire, 6½d.; copper wire, 7¾d.; rolled brass, 6¼d. per lb.; copper sheets £68 per ton. This increase in prices has in no way checked the demand, and with locomotive builders, general engineers, and iron and brass founders all exceptionally busy, there is an active business doing in all descriptions of manufactured goods.

A fairly satisfactory business has been done in the timber trade; imports are not in excess of the demand, prices generally are steady, and stocks only moderate. In East India teak, several consignments of logs and planks have come forward, and met with a ready sale at better prices, the demand generally being good, with stocks not excessive. Only one cargo of greenheart has arrived, and the stock is light with values unchanged.

The coal trade continues extremely depressed, and the absence of business of any weight has compelled collieries to go on to three-and-a half to four days per week. House coals necessarily move off very slowly, and although nominally list rates are unchanged, prices are weak and irregular, concessions being obtainable for prompt delivery. Steam and forge coals are in fair demand, but supplies are plentiful, and prices continue extremely low. At the pit-mouth, best house coals average 9s. 6d. to 10s.; seconds, 8s. to 8s. 6d.; common house coal, 6s. 6d. to 7s., and steam and forge qualities, 5s. 6d. to 6s. per ton. The usual gas coal contracts, which are now on the market, are being tendered for at very low figures, about 3d. under last year's rates being quoted, and the average figures are about 6s. 3d. for ordinary screened Wigan four-foot gas-coal, and 6s. 9d. to 7s. for the better qualities of Arley gas coal, at the pit-mouth. Engine fuel, with the limited production of slack, is rather scarce, and prices show a hardening tendency; and an advance of about 3d. per ton has been got without difficulty in most cases, 3s. 3d. to 3s. 9d. being now the average for common slack, and 4s. 6d. up to 5s. for better qualities, at the pit-mouth.

For shipment, business is very slow, with no better prices obtainable, ordinary steam coal delivered at Mersey ports, or Partington tips, Manchester Ship Canal, not averaging above 7s. per ton.

BELFAST TRADE NOTES.

(*From our own Correspondent.*)

THE agreement come to between the engineer employers and the A.S.E. regarding the wages question has produced a feeling of security in the trade here, which will go far to keep business in the brisk condition it has been characterised by during the last few months. This settlement, it seems, fixes the wages for another six months, and will prevent any interruption of contracts for that time (at least by the engineers).

The principal event of the month here has been the launching of the large steel screw-steamer *China*, for the Peninsular and Oriental Steam Navigation Co. The vessel is 500 ft. in length, by 54 ft. beam, and will have two schooner-rigged masts. Her gross tonnage is about 8,550, and she will be propelled by a single set of triple-expansion engines of 7,500 I.H.P. The vessel will carry a large number of first and second-class passengers, accommodation for them being provided on the hurricane, spar, poop, main and lower decks. She will be fitted up in every way as a first-class mail and passenger steamer, having a full installation of electric light, also refrigerating chamber for cargo and stores, and hydraulic deck machinery. This makes the fifth steamer built by Messrs. Harland & Wolff for this well-known company.

This firm also launched the T.S.S. *Comic*, built to the order of the Belfast Steam Shipping Co. This vessel is a sister boat to the *Mystic*, and is intended for passengers and cargo service between Londonderry and Liverpool. Another steamer, named the *European*, will shortly be put into the water from the south end of the Queen's Island. This vessel has been built to the order of the West India & Pacific Co., Liverpool. Altogether the Abercorn basin, adjoining Messrs. Harland & Wolff's shipyard, presents an extremely busy appearance at the present time, as, besides the aforementiond *China* and *Comic*, it also contains three other very large twin-screw steamers, viz., *Scot*, *Canada* and *Ikbal*. The last mentioned, formerly owned by Messrs. Bates, but recently sold to the Johnston Line of Liverpool, is being adapted to the requirements of the cattle trade.

The Union Co.'s *Scot* is also fast approaching completion, and will shortly afford a fine opportunity of testing the result of the lengthening process which she has undergone.

Messrs. Workman, Clark & Co. launched during the month the s.s. *Antenor*, to the order of Messrs. A. Holt & Co., Liverpool. This vessel is a duplicate of the s.s. *Patroclus*, which left early in the month for Liverpool.

The first consignment of the engines for H.M. Battleship *Hannibal* have been despatched to Pembroke. It consisted of the port engine and several of the boilers. The other engine will follow in due course.

In both yards all the slips are full, or keels will shortly be put down. The repair shops, however, are suffering from a decided dearth of repair work.

NORTH-WEST OF ENGLAND.

(*From our own Correspondent.*)

Barrow.—The shipbuilding and marine engineering trades of this district have been steadily employed during the past month, but there have been no special features of new life which are worth recording. Business has been slow so far as new orders are concerned, yet there has been a steady enquiry for commercial tonnage. Orders, however, are not given out at profitable prices, and those builders who look for a small margin of profit find it difficult to secure new work. There is the further fact that builders throughout the country have had to respond to an appeal for an increase in workmen's wages, with the consequence that higher quotations are rendered absolutely necessary in tendering for ships. Business in the higher qualities of commercial tonnage shows a hopeful prospect, and there is reason to anticipate that the lull in this class of work which has been experienced for some time is about to give way to an active trade. Some of the big lines, which have not for some time ordered new ships, are now coming into the market, and an entirely new line, that for connecting Great Britain with the Dominion of Canada by a fast fleet of boats across the Atlantic is now spoken of as an almost realised fact. Some years ago in connection with the development of steam navigation with the colonies the three *Empresses* were built at Barrow for the Pacific station, and have proved highly successful, and have done much to popularise this new route to the East. It is now contemplated to put on a service of steamers between Vancouver and Australia and New Zealand, and to connect with the mother country by means of the Canadian Pacific Railway and a new Atlantic service of high-flyers. Much probably depends on the result of the Canadian elections as to the action that will be taken in relation to this enterprise, but it is probable, whichever government is elected, there will be a move in this direction, and that the foundation will be thereby laid for a substantial improvement in Canadian and colonial enterprise. Several firms have already tendered to the Canadian Government schemes and terms on which they will put down a service of four 20-knot 8,500 ton liners, equal to any ships afloat, and the Barrow Co., which has taken an interest in this matter from its original inception, is included in the list of those who have offered to undertake and finance this work. Before long something will probably come of this new development. Some other high-class jobs are offering at present, and there is also a prospect of new Admiralty work. The Barrow Co. is one of the firms that has been asked to tender for the building of one of the two new battleships that are to be constructed in the yards of private builders, and in the course of about a month these tenders will be sent in. Other Admiralty work has still to be given out to private builders, including replicas of the first-class cruiser *Niobe*, building at Barrow, and duplicates of the second-class cruiser *Doris*, also building at Barrow. The Barrow Co. should have a good chance of some of this work. The work of constructing the *Niobe* is making satisfactory progress, and builders are not having to wait for the delivery of material to the extent that was the case in the *Powerful*, and the experience the local firm has had with the latter vessel stands them in good stead with the *Niobe*. The cruiser is well in frame, and the plating work is proceeding apace.

The four torpedo-boat destroyers are making marked headway, and the *Bittern* and *Avon* will soon be ready for launching, although the order more recently accepted for the *Otter* and the *Leopard* has by agreement to be completed before the first-named boats. The engines for these fast boats are being rapidly proceeded with, as also are the Thorneycroft boilers, by means of which these craft are to be propelled thirty knots per hour. The other two jobs in the shipbuilding yard of the Naval Construction and Armaments Co. are the Clan Liner *Sutherland*, which is well in frame, and the Barrow and Belfast twin-screw steamer, the keel plate of which is being laid. On the other side of the yard in the outfitting dock the first-class cruiser *Powerful* has been completed, and is now ready for delivery to the Admiralty. The order for this monster cruiser was given in January, 1894, and three years were allowed for building her. The work has been completed within two and a half years, and the Barrow Co. in this matter has not only shown the great capacity of its yard, but has won marked appreciation from the Admiralty in regard to the satisfactory as well as the speedy way in which they have turned out so large a job. The *Powerful* is now awaiting the navigating party which is to take her from Barrow to Portsmouth. It has been fixed that the *Powerful* will leave Barrow for Devonport on the 13th July. On the 18th, 19th, and 20th of June, the *Powerful* was opened for public inspection, and the charge that was made for admission, and the collections that were taken on board, were on behalf of the Barrow charities. The amount realised was £249 7s. 8d. About 10,000 people took advantage of the opportunity afforded of visiting the cruiser, an evidence of the great interest that has centred itself in Barrow and district in the building of this great ship. Further progress has been made with the work of completing the second-class cruisers *Juno* and *Doris*, and it is evident they will be ready to hand over to the Admiralty at an early date. The engineering trade in marine shops is brisk, and the work is proceeding satisfactorily. In addition to the commercial work in hand, and the Admiralty orders which are engaging attention, engineers are busy on the tripling of the *Clan Sinclair* of the Clan Line, and it is whispered that other tripling jobs, as well as the order for other new steamers may be expected from the Clan Co. at an early date. This company has perhaps had more tonnage built than any other shipping firm during recent years, and the growth of its African, Indian, and Persian trades during the last decade has not only justified the developments that have taken place, but is necessitating, even at the present moment, further enterprise which the owners seem disposed to encourage. Apart from the Clan liner and a pleasure steamer there is no other repair work in hand.

West Cumberland.—The shipbuilding trade in West Cumberland remains steady, and builders are steadily employed on good contracts, with prospects of new work so soon as they are in a position to undertake it.

Shipbuilding Material.—There is a continued brisk demand for shipbuilding material, and the mills in the district are as busily employed as can be, working regularly night and day, Sundays excepted. The demand for plates is brisk as well on local as on general account, and indications certainly point to a continuance of activity on this account. Very little is now done in this district in angles, as mills specially put down on an economic basis of working are found able to compete with the trade on more favourable terms than can firms who have the old type of mills only to depend on. There is, however, a brisk business in heavy steel castings for ship work, and the steel foundries are working overtime regularly. It is quite clear if the present trade can be maintained, and it seems likely to expand, that a further increase in foundry accommodation and plant will be required, and a development in this direction at Barrow may be looked for in the early future.

The Hematite Trade.—The demand for all qualities of Bessemer iron is well maintained, but there is very little business doing in forge and foundry iron. Prices are steady at 48s. to 49s. for mixed Bessemer Nos. net f.o.b., while warrant iron stands at 47s. 3d. net cash sellers, 47s. 2½d. buyers. Stocks have increased during the month about 5,000 tons, and now represent about 310,000 tons. Makers are very well sold forward, and are looking forward to a continuance of activity throughout the remainder of the year. Thirty-eight furnaces are in blast as compared with 29 in the corresponding week of last year, and this represents about 30,000 tons which is going into delivery per week.

Shipping.—The shipments of metal from West Coast ports show a steady increase. The exports of pig-iron to date this year total up to 147,752 tons, and of steel to 226,054 tons, as compared with 126,748 tons of pig-iron and 170,799 tons of steel in the corresponding week last year, an increase of 21,004 tons of pig-iron and 55,255 tons of steel.

Miscellaneous.

Hints on the Use and Care of Hydraulic Leathers.—We have recently received from Messrs. Fleming, Birkby & Goodall, Limited, of West Grove Mill, Halifax, a copy of their latest price list, with which is combined a series of valuable hints on how hydraulic leathers should be made and used, so as to ensure the greatest efficiency and prolong the duration of these necessary adjuncts to hydraulic machinery. *Inter alia*, the pamphlet touches upon the importance of using clean water or oil, and gives a very useful table showing the frictional resistance in percentage of the total hydraulic pressure for rams ranging from 2 in. up to 20 in. in diameter. The book is illustrated with blocks showing the various forms of leathers made by the company, and two views of the "Gilbert" wood split pulley, for which the firm are sole European agents, are also given. Copies of the book may be obtained on application to the company at the above address, or at the London office, 36, Lime Street, E.C.

The Lord Kelvin Jubilee Celebration.—A unique and most brilliant assembly of ladies and gentlemen from all parts of the world was held in Glasgow University on Monday evening, June 15th, when the University and the Corporation combined to do honour to Lord Kelvin on the occasion of his jubilee as a professor. Many representatives from courts and universities, home and foreign, assembled in Glasgow to be present at the festivities. The Institute of Marine Engineers, of which Lord Kelvin is a past president, was represented by Mr. James Adamson, the honorary secretary, who is a member of the University Club in London. He was accompanied by Miss Macartney at the conversazione held on Monday evening. Professor Elliott, D.Sc. (President of the Bristol Channel Centre of the Institute of Marine Engineers), was present, representing the University of South Wales.

Presentation to Mr. R. Wise.—Our readers associated with the engineering and shipbuilding industries of Southampton will learn with deep regret that Mr. R. Wise, engineering manager to Messrs. Day, Summers & Co., of the Northam Iron Works, is relinquishing his position in the service of the firm. In order to show their appreciation of the courteous way in which he has always treated them, and also to give expression to their own personal esteem, the heads of the various departments, the foremen, and a few friends who had had close business relationship with him, assembled in his office on last Wednesday evening, and asked his acceptance of a purse of gold. Mr. F. Perrott, foreman of the engineering department, in making the presentation on behalf of the subscribers, alluded to the excellent relationship which had always existed between the manager and his subordinates, and expressed a sincere hope that his future career would be a very prosperous one. Mr. R. Farquhar, shipyard manager, bore testimony as to the spirit of cordial cooperation which had always existed between Mr. Wise and himself, and he voiced the desire of the whole of the shipyard when he wished Mr. Wise all happiness and success in the change that had taken place. Mr. J. J. Isted, on behalf of the counting-house department, expressed deep regret at Mr. Wise's impending departure, and thoroughly endorsed the good wishes of previous speakers. Mr. Pinkerton, foreman moulder, also wished him every success. Mr. C. W. Murray, consulting engineer and naval architect, of Oriental Place, Southampton, said that though present as an outsider, he thought it a privilege to be allowed to take part in the proceedings. Twenty-one years ago he was an apprentice, then in the drawing office, when Mr. Wise assumed the position of chief draughtsman. As one of Mr. Wise's pupils he thought it only right to say that any success he had attained in engineering matters was largely due to the excellent training received at the hands of Mr. Wise. He was also commissioned by several friends who had important engagements elsewhere to testify their appreciation of the courteous treatment always received by them when in contact with Mr. Wise, and their appreciation of the uprightness which had always characterised his dealings with them.

Hopper Dredger.—Messrs. Wm. Simons & Co., Limited., Renfrew, have received an order from the Mersey Docks and Harbour Board to construct a powerful hopper dredger. The hopper is to have a capacity to contain 1,200 tons of dredgings and is to be filled by powerful hydraulic apparatus.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES.—English.

Dagmar.—On May 12th the *Dagmar*, a steel schooner-rigged steamer of about 1,500 tons gross, was launched at Middlesbrough, owned by Messrs Weil & Amundsen.

Sheepvaart. — On May 13th the *Sheepvaart*, a steel schooner-rigged sailing vessel of about 650 tons gross, was launched at Middlesbrough, owned by Mr. F. W. Randebrock.

Sevastopol.—On May 14th a steel schooner-rigged steamer of 878 tons, named the *Sevastopol*. was launched at Sunderland, owned by the Azof Steam Navigation Co.

Ville de Cayenne.—On May 16th the *Ville de Cayenne*, a steel schooner-rigged steamer of about 250 tons gross, was launched at Middlesbrough.

Russia.—On May 19th a steel schooner-rigged steamer of 1,270 tons, named the *Russia*, was launched at Newcastle, owned by Russian Co. for Tea River and Land Insurance and conveyance of goods, Odessa.

Carinthia.—On May 20th a steel and iron steam ketch, of about 120 tons, was launched at North Shields, and was named *Carinthia*. Owned by the Grimsby Alliance Steam Fishing Co.; port of registry, Grimsby.

Innisfallen.—On May 26th Messrs. Wigham Richardson & Co. launched at Newcastle a steamer named the *Innisfallen*, which they are building to the order of the City of Cork Steam Packet Co., of Cork. The vessel is built of steel, and is intended for the passenger service between Milford and Cork, in conjunction with a special service of fast trains from London. She is 283 ft. in length by 35½ ft. beam, and will have accommodation for a large number of first and second class passengers. The propelling machinery is also being constructed by Messrs. Wigham Richardson & Co., the engines being of the four-crank triple-expansion type, working at 160 lbs. pressure, and balanced on the well-known Yarrow, Schlick and Tweedy system.

Europa.—On May 27th there was launched from the yard of the Blyth Union Co-operative Shipbuilding Co., a small wooden screw steamer, built to the order of Mr. Watkins, London, intended for passenger towing and surveying purposes in the Mediterranean. The steamer has been built under Lloyd's special survey, is copper fastened, and sheathed with yellow metal. As the vessel left the ways she was christened the *Europa*.

Adria.—On May 27th there was launched from the Jarrow yard of Messrs. Palmers' Shipbuilding and Iron Co., Limited, a large screw steamer, built to the order of the Hamburg-American Steam Navigation Co., Hamburg. Her dimensions are as follows:—Length, between perpendiculars, 400 ft.; beam, 50 ft.; depth, moulded, about 30 ft. 3 in. The vessel will be rigged as a two-masted fore-and-aft schooner, and has been constructed under special survey to obtain German Lloyd's highest class, and is of the three deck type, with combined poop and bridge, extending to right end of main hatch, and a topgallant forecastle. The main and upper decks are of steel, all fore and aft, and all the exposed decks are sheathed with wood. A double bottom for water ballast is fitted all fore and aft, and divided at the centre line for the purpose of assisting to trim the vessel, a separate system of piping being fitted on each side of centre-line division, enabling each compartment to be filled and emptied independently. The vessel has been designed for the emigrant, cattle and general cargo trade, and will be lighted throughout by electricity, and fitted complete with all the latest improvements for this service. The accommodation for the captain, officers, engineers, and also galleys and emigrants' hospitals, &c., will be in the deckhouses on the top of the bridge, and in side houses in fore end of bridge, and also part of the lower 'tween deck aft will be fitted with accommodation for 300 to 400 emigrants. The emigrants' berths are of Hoskins' latest patent, and are fitted along each side in separate rooms for 10 persons each, the centre of the deck being left clear for the table, seats, &c. The whole of the fittings are portable, and the space may thus be readily converted for carrying cattle or general cargo. The remainder of the 'tween decks not occupied by the emigrants will be fitted for cattle, and a complete system of water service, side lights, fan ventilators, &c., will be supplied and fitted as in first-class cattle boats. A small insulated space is fitted in the lower hold aft with refrigerating machinery, &c., complete for stowing ice, vegetables and meat for the use of the emigrants and crew. The remainder of the space in lower holds to be fitted for general cargo, and a complete system of steam winches, derricks, and steam cranes for the efficient working of general cargoes, will be fitted. The engines, which are also built by the Palmers' Co. are of the four-crank quadruple-expansion type on the Lehlick system, with cylinders 22½ in., 32 in., 47 in., and 68 in. by 51 in. stroke, steam being supplied by one double and two single-ended cylindrical boilers, working pressure of steam 210 lbs. All modern apparatus and appliances for the most efficient and economical working are being fitted, and the whole of the vessel and machinery is being constructed to meet the requirements of the German emigrant service. As the vessel left the ways she was gracefully christened the *Adria* by Miss Wilson, daughter of Mr. J. P. Wilson. The company then adjourned to the model-room, where the usual congratulatory toasts were honoured.

Alette.—On Wednesday, May 27th, Messrs. William Gray & Co., Limited, launched a large steel screw steamer, which they have built to the order of Mr. O. W. Nordin, of Hernosand and Paris. The vessel will take Lloyd's highest class, and is of the following dimensions, viz.:—Length, over all, 336 ft.; breadth, 48 ft.; depth, 24 ft. 2 in.; with long bridge and topgallant forecastle. A handsome saloon and state-rooms, together with the captain's room, will be fitted up in a large deck house on the bridge-deck. The officers' and engineers' accommodation is also amidships, and the crew's berths forward. The hull is built with deep framing, web frames and web beams, dispensing entirely with beams and pillars in the holds, which is a new feature in so large a vessel. A cellular double bottom is fitted throughout for water ballast, exceptionally large hatchways are fitted, seven powerful steam winches, patent steam steering gear amidships and hand screw gear aft, large patent donkey boiler, stockless anchors and iron centre bulkhead to prevent shifting of cargo, two masts with fore-and-aft rig. The vessel is built and equipped as a first-class cargo ship, but is specially designed for the timber trade, for which she is very highly adapted. First-class triple-expansion engines are being supplied by the Central Marine Engine Works of Messrs. William Gray & Co., Limited, having cylinders 24 in., 38 in. and 64 in. diameter, with a piston stroke of 42 in., and fine large steel boilers with a working pressure of 160 lbs. per square inch. The vessel and machinery have been constructed under the superintendence of Mr. Jean Drakenberg, of Stockholm, and Mr. J. Thompson, Sunderland, on behalf of the owner, and the ceremony of naming the vessel *Alette* (which is the name of the owner's mother) was gracefully performed by Miss Nordin, Paris, who came here specially to name the vessel. The *Alette* will be commanded by Captain Gustaf Stenfeldt.

Norman Isles.—On May 28th the largest steamer of the turret-deck type yet built was launched from the yard of Messrs. W. Doxford & Sons, Limited, of Pallion, Sunderland. The vessel, which on completion will be owned by Messrs. A. N. Nansen & Co., of Copenhagen, is specially fitted throughout for rice cargoes, for which trade she is principally intended. Her dimensions are:—Length, 340 ft.; breadth, 45¼ ft.; depth, 27¼ ft.; deadweight capacity, 5,600 tons on 21 ft. 8 in. draught; gross register, about 3,400, net about 2,190, with a measurement capacity of 301,000 cubic feet. She is to be fitted with triple-expansion engines built by Messrs. Doxford, to work at a pressure of 180 lbs., steam being raised in two of Babcock and Wilcox's patent water-tube boilers. The vessel was named *Norman Isles*.

Euphrates.—On Thursday morning, May 28th, Messrs. Cochrane & Cooper launched from their yard at Grovehill, a steam trawler named the *Euphrates*, built to the order of Mr. Hamling, of Hull. The dimensions are:—108 ft. 4 in. long; 21 ft. wide; and 11 ft. 6 in. deep. Messrs. C. D. Holmes & Co., of Hull, will provide triple-expansion engines of 50 H.P.

Iolanthe.—On May 30th, an iron steam ketch of about 150 tons was launched at Hull, and was named *Iolanthe*. Owned by C. Hellyer & Co., Limited; port of registry, Hull.

Umguza.—On May 30th Messrs. Cochrane & Cooper launched at Grovehill, Beverley, an iron steam trawler, built to the order of the Union Steam Fishing Co., of Grimsby. The vessel, which is 93 ft. between perpendiculars, 20 ft. 6 in. wide, and

11 ft. deep, was named the *Umguza*. The engines, of 40 H.P., triple-expansion, will be fitted by Messrs. C. D. Holmes & Co., of Hull.

Essex.—On June 8th Earle's Shipbuilding and Engineering Co. launched, for the Great Eastern Railway Co., a smart-looking double-headed paddle steamer, for their local river and excursion traffic between Harwich and Ipswich and neighbourhood. The vessel, which was named the *Essex*, is very similar to, but slightly larger than, the *Suffolk*, built for the same service last year, being 175 ft. long, 23 ft. beam, and 7 ft. 3 in. depth, and is specially adapted for work in the shallow waters of the eastern counties. The engines are of the compound type, on the direct-acting diagonal system, having cylinders 24 in. and 48 in. diameter, by a stroke of 42 in., operating on a paddle shaft fitted with wheels having feathering floats, and steam for these is supplied by two single-ended cylindrical steel boilers, which will work at 110 lbs. pressure. The naming of the ship was undertaken by Miss K. Howard, daughter of Captain D. Howard, the Great Eastern Railway Co.'s marine superintendent, who, with Mr. James Holden, their locomotive superintendent, and Mr. G. Derry, the superintendent engineer, represented the owners on the occasion, while Earle's Co.'s officials included Mr. Frank H. Pearson, Mr. G. J. Cole, and Mr. D. Douglas

Oberon.—On June 8th there was launched from Messrs. Sir W. G. Armstrong & Co.'s Walker Shipyard, the second of two steel screw steamers built to the order of Messrs. Lars Krogius & Co., for the Finska Steam Shipping Co., of Helsingfors. The ship has been constructed to take the highest class at Lloyd's on the spar-deck rule. The chief dimensions of the vessel are:—Length, 290 ft. 6 in.; breadth, 38 ft.; depth, moulded, 22 ft. 7 in. She is rigged as a two-masted fore-and-aft schooner, and is capable of carrying 2,500 tons deadweight on a moderate draught of water. Under the bridge-deck there is a handsome dining-saloon fitted up with oak and lincrusa-walton, also state-rooms for 12 first-class passengers. Adjoining the saloon there is accommodation for the captain, officers, and engineers. In a large deck-house on the bridge-deck there is the chart-house, smoking-room, and saloon entrance. The crew will be berthed in a topgallant forecastle. The ventilation of the steamer has been specially considered with a view to carrying fruit cargoes, and for this purpose a complete system of patent torpedo head ventilators have been fitted. The vessel was named *Oberon* by Madame Lars Krogius, of Helsingfors. After the launch the vessel was taken to Messrs. Wigham Richardson & Co.'s works, where she will be fitted with triple-expansion machinery.

Reindeer.—On June 9th Messrs. John Priestman & Co. launched from their shipyard the fine screw steamer *Reindeer*, built to the order of Messrs. Jackson Brothers & Cory, of London. This vessel has been built to the highest class at Lloyd's, viz., 100 A1, and her principal dimensions are:—Length, 290 ft.; breadth, 43 ft.; and moulded depth, 19 ft. 9 in.; with a carrying capacity of about 3,600 tons. The deck erections consist of a poop, raised quarterdeck, and partial awning deck forward. A handsome saloon, together with spacious accommodation for captain and officers, will be fitted under the poop. The engineers are berthed at the after end of the engine casing and the crew under the awning deck forward. There are six main bulkheads of steel, and double bottom for water ballast in each hold, also under the engines on the cellular double bottom principle. The engines and boilers have been constructed by Messrs. Thomas Richardson & Sons, Hartlepool, the engines having cylinders 22 in., 35 in., and 59 in. diameter, with 39 in. stroke, and two large boilers of the single-ended type, designed for a working pressure of 160 lbs. per square inch. The construction of the hull and machinery have been carried out under the supervision of Mr. Dumblin, the owner's superintendent. The launch was in every way a complete success, the christening ceremony being performed in a most novel and pretty manner by Miss Jackson, of London. As the vessel glided down the ways the lady released a cageful of birds from the forecastle deck by means of a ribbon led down to the starting platform. The birds flew in all directions, typifying the diverse nature of commerce. This idea, which is borrowed from the Japanese, teaches liberty and economy. After the launch the ladies and gentlemen present partook of luncheon, and Mr. Walter Jackson, who was present, said they were more than satisfied with the vessel the builders had given them.

Rosemount.—On June 10th there was launched from the shipbuilding yard of Messrs. Wood, Skinner & Co., at Bill Quay, Newcastle-on-Tyne, a handsome steel screw steamer, built for service on the inland lakes of Canada. The vessel is of the single deck type, and of the following dimensions, viz.:—Length, between perpendiculars, 253 ft.; beam, 41 ft.; depth, moulded, 21 ft. 4 in.; and is designed to carry a large measurement cargo on a light draught of water. She has been built under special survey for Lloyd's highest class, and has water ballast in cellular double bottom all fore and aft, and also in fore and aft peaks. The cabins are arranged in poop aft; accommodation for engineers being provided in house on deck amidships and for crew in forecastle. Large cabins for captain and owner are fitted in house on deck forward, over which is chart-house and wheel-house, built on bridge deck, with flying bridge above. The vessel will be rigged as a three-masted schooner, and will be fitted with large hatchways and all the most modern appliances for the rapid loading and discharging of grain cargoes, in which trade she will be principally employed. As the vessel left the ways she was named *Rosemount* by Miss Lilian Irwin, of Sunderland. After the launch she was immediately taken to the engine works of the North-Eastern Marine Engineering Co., Limited, at Wallsend, where she will be fitted with a set of engines of the triple-expansion type, having cylinders 20½ in., 34 in., and 57 in. diameter respectively, with a stroke of 39 in., steam being supplied by two large steel boilers working at a pressure of 180 lbs. per square inch. The machinery has also been constructed to Lloyd's requirements and survey, as well as under the superintendence of Mr. Alexander Gray, of Newcastle, the inspector to the owners.

Borgom.—On June 10th the steamship *Borgom* was launched from the yard of Messrs. Sir W. G. Armstrong & Co. She is a steel single-decked tank steamer for carrying petroleum in bulk, and also case oil, for the economical loading and discharging of which special arrangements of winches, &c., have been made. Her dimensions are as follows:—Length, 320 ft.; breadth, 42 ft.; depth, moulded, 22 ft. 2 in. The engines will be of the triple-expansion type, by the North-Eastern Marine Engineering Co., of Sunderland, having cylinders 24 in., 40 in., 64 in., by 42 in. stroke. They will take their steam from two single-ended boilers, 15 ft. 3 in. diameter and 10 ft. 6 in. long, with four furnaces in each boiler so arranged that oil residuum may be used as fuel. The vessel has been constructed from the designs and under the superintendence of Messrs. Flannery, Baggallay & Johnson, of London and Liverpool, for A. Mantachoff, Esq., and is of large carrying capacity. She will be supplied with powerful pumping system for the quick discharge of liquid cargo. Her electric lighting installations has the latest improvements, and is fitted throughout the vessel.

Farringford.—On June 10th Messrs. Joseph L. Thompson & Sons, Limited, North Sands shipbuilding yard, Sunderland, launched a finely-modelled steam screw cargo vessel, built to the order of Messrs. Charlton & Thompson, of the Baltic Chambers, Sunderland, and is the second vessel built at this yard for these owners. She is a single-decked type of vessel built to Lloyd's highest class, compensating strength being fitted in lieu of the main deck being laid. The dimensions are:—325 ft. b.p., 45 ft. 5 in. beam, extreme, by 26 ft. 4 in. depth, moulded, which will give a deadweight capacity of about 5,000 tons on a moderate draught of water. She is built with a cellular double bottom, web frames right fore and aft, longitudinal intercostal stringers, and six transverse watertight bulkheads. Four large cargo hatches are fitted on the upper deck, and a reserve bunker hatch, which may also be used for cargo. The deck machinery consists of five powerful steam winches, patent steam windlass, patent steam steering-gear in the after end of the engine casings, and a powerful screw gear attached to the rudder-head. She is rigged as a fore and aft schooner, with telescopic polemasts. Accommodation is provided in the poop for the captain, chief officer, steward, bathroom, pantry, and a few berths for passengers, with a handsome saloon, and a messroom for the officers fitted aft of the saloon, with the usual accommodation for stores, &c. At the after end of the bridge accommodation is provided in side houses for the engineers, a large messroom and bathroom, and at the forward end for the officers, petty officers, lamp and paint lockers, &c. The crew are berthed in the topgallant forecastle. The galley is fitted at the forward end of the engine and boiler casings, and the chartroom on the top of the bridge, with a flying bridge over this. Four large boats are also berthed on top of the bridge. A fore-and-aft gangway is fitted, joining the bridge and poop decks. Special attention has been paid to the sanitary arrangements of the vessel, and also to the equipment and arrangements for the rapid handling of cargoes. The deck machinery is worked by a large multitubular donkey boiler, made to stand a working pressure of 180 lbs. per square inch. The main engines and boilers are built by Messrs. John Dickinson & Sons, Limited, Sunderland, the cylinders being 23 in., 38 in., and 62 in., by 42 in. stroke, supplied with steam by two extra large multitubular boilers working at 180 lbs. pressure. The engines and boilers are fitted with all the most modern arrangements and appliances. The vessel was gracefully launched by hydraulic power by Miss Eyres, of Low Fell, who at the same time christened her the *Farringford*. The launch was most successful in every way, after which the company adjourned to the luncheon room of the firm, where the usual toasts were duly honoured.

Iberia.—On Thursday afternoon, June 11th, Messrs. Richardson, Duck & Co. launched from their yard a steel screw steamer of the following dimensions:—Length, over all, 319 ft. 6 in.; breadth, extreme, 44 ft.; depth, moulded, 22 ft. 10½ in.; gross tonnage about 2,420 tons. This vessel which has been built to the order of Messrs. A. C. de Freitas & Co., of Hamburg, will class 190 A1 at Lloyd's, and has been built under special survey. She is of the single deck type, having a poop aft for the accommodation of captain and officers, bridge over engines and boilers, with engineers berthed at after end, and a topgallant forecastle for crew. A cellular double bottom for water ballast is fitted throughout, also after peak tank, and the equipment includes large multitubular donkey boiler, four steam winches, steam windlass, stockless anchors, steam steering gear, &c. The engines by Messrs. Blair & Co., have cylinders 22½ in., 37 in., and 61 in. by 42 in. stroke, steam being supplied by two single-ended boilers working at a pressure of 160 lbs. As the vessel was leaving the ways she was christened *Iberia* by Miss Eleanor Dale, of Stockton-on-Tees.

Zuid Holland.—On Friday, June 12th, Sir Raylton Dixon & Co. launched, from their Cleveland dockyards, Middlesbrough, a steel screw collier which has been built to the order of the American Petroleum Co., Rotterdam, for the Scheepvaart en Steenkolen Maatschappv. The principal dimensions are 229 ft. by 34 ft. by 17 ft. 6½ in. moulded, and she has a deadweight capacity of about 1,700 tons. She is built to Lloyd's 100 A1 steel raised quarterdeck class, bridge and forecastle decks pitch pine, main and quarterdecks steel, and is fitted with four bulkheads, water ballast in cellular bottom, plate keel and wide-spaced hold beams. The vessel is built from the designs, and under the superintendence of Messrs. Flannery & Tritton, of Liverpool and London. Triple-expansion engines will be supplied by Messrs. The North-Eastern Marine Engineering Co., Limited, Sunderland, having cylinders 19 in., 31½ in., 51½ in. by 36 in. stroke, supplied with steam by two single-ended boilers 11 ft. 9 in. by 10 ft. 6 in. long, with a working pressure of 170 lbs. This steamer will be specially fitted with very strong towing gear for the purpose of towing the 1,000-ton barges which have been recently constructed by her builders for the above-named owners and are to be employed in the carrying of coals direct from the North-East coast of England to alongside steamers in Rotterdam and adjacent ports. This being an entirely new experiment in the coal-carrying trade is being watched with very much interest by others engaged in the trade. The barges we will again mention are specially constructed for sea-going, with large water ballast capacity, masts, derricks and steam winches, with heavy equipment of anchors and cables so as to be able to take care of themselves in case of being cast adrift in bad weather. On leaving the ways she was named *Zuid Holland*.

Ematru.—On June 12th there was launched from the yard of the South Hylton Shipbuilding Co. (Mr. John Fisher) a screw tug, built to the order of a Russian firm. The engines are by Messrs. Hedley & Boyd, of North Shields, with cylinders of 15 in. and 30 in. respectively. The vessel has a length of 65 ft., with a breadth of 15·8 ft. and a depth of 9 ft. Upon leaving the ways she was christened the *Ematru* by Miss Routledge, of Jarrow.

Kingswood.—On June 12th Messrs. Ropner & Son, of Stockton-on-Tees, launched a steel screw steamer of the following dimensions, viz.:—Length between perpendiculars, 270 ft.; breadth, extreme, 39 ft. 6 in.; moulded depth, 17 ft. 6 in: which they have built for Christian Klaveness, Esq., of Christiania. The vessel is built as a part awning-decked steamer, with raised quarterdeck, her deadweight carrying capacity being 2,625 tons on 17 ft. 7½ in., the saloon and cabins for captain and officers, and also the engineers' accommodation, being fitted in deckhouses amidships. She is built on the web frame principle, leaving the holds entirely clear for cargo, and carries her water ballast in a cellular bottom and in the after peak. All labour-saving appliances are fitted for the economical working of the steamer, and also for the expeditious loading and unloading of cargoes. She has steam steering gear amidships and screw gear aft, four powerful steam winches, a large multitubular donkey boiler, direct steam windlass, stockless anchors, &c. The engines will work up to about 900 effective H.P., and are by Messrs. Blair & Co., Limited, having cylinders 20 in., 33 in., and 54 in., by 36 in. stroke, steam being supplied by two large steel boilers working at 160 lbs. pressure.

Yoog.—On June 13th Messrs. R. & W. Hawthorn, Leslie & Co., Limited, launched from their yard at Hebburn-on-Tyne, a steel twin-screw passenger and cargo steamer, 216 ft. 6 in. by 28 ft. by 14 ft. 4 in., the first of two building to the order of the Eastern Carrying, Storing and Warrant Co., of St. Petersburg. The vessel is built to the requirements of Bureau Veritas, and designed and fitted throughout to meet the special Caspian Sea trade, for which the company intend her. On leaving the ways the vessel was named *Yoog* by Miss Danielson, daughter of the owners' representative, Captain G. Danielson.

Atlantic.—On Saturday, June 13th, Messrs. William Gray & Co., Limited, launched a fine large steel screw steamer, which they have built to the order of Messrs. W. H. Cockerline & Co., of Hull. She will take Lloyd's highest class, and is of the following dimensions, viz.:—Length over all, 336 ft.; breadth, 47 ft.; and depth, 24 ft. 10 in. The deck erections consist of a full poop, long bridge, and topgallant forecastle. The saloon and captain's and officers' rooms will be fitted under the poop. The hull is built with web frames and cellular double bottom for water ballast. Five steam winches, steam steering gear amidships, and screw gear aft, patent direct steam windlass, patent donkey boiler, grain divisions, stockless anchors, and a complete outfit will be fitted for a first-class cargo boat. Three cylinder triple-expansion engines of first-class make are being supplied by the Central Marine Engine Works of William Gray & Co., Limited. They will develop over 1,200 H.P. The cylinders are 24 in., 38 in., and 64 in. diameter, with a piston stroke of 42 in., and fine extra large steel boilers, having a pressure of 160 lbs. per square inch, will give an ample supply of steam. The construction of the ship and machinery have been under the superintendence of Mr. G. H. Strong, of Hull, on behalf of the owners; and the ceremony of christening the steamer *Atlantic* was gracefully performed by Miss Edith Cockerline, youngest daughter of the managing owner.

Seti.—On June 15th Messrs. Cook, Welton & Gemmell launched from their yard a steam trawler to the order of Messrs. R. W. Roberts & Co., Grimsby. The vessel was named the *Seti*. She is a duplicate of the steam trawler *Rameses*, recently built by the same firm, and is fitted with Mr. Roberts' own improvements for working the "Otter" board fishing gear.

Thornley.—On Saturday, June 20th, there was launched from the shipbuilding yard of C. S. Swan & Hunter, Limited, of Wallsend, a fine steel screw steamer, built to the order of W. R. Rea, Esq., and Charles M. Legg, Esq., of Belfast. The steamer is of the partial awning deck type, with long full poop, raised quarterdeck forward, and topgallant forecastle, thus improving upon the common design of these steamers, with a view to obtaining more measurement space at the after end of the vessel, and to ensure her trimming better when loaded with homogeneous cargo. The steamer has a cellular double bottom throughout the length for water ballast. She will also be fitted with powerful steam winches, as well as steam steering gear, steam windlass, &c., all by the best local makers. The dimensions of the vessel are 312 ft. b.p. by 41 ft. by 23 ft. 1½ in. moulded, and she has been designed to carry deadweight cargo of 4,350 tons on a moderate draught, as well as an unusually large measurement cargo. The machinery is being constructed by the North-Eastern Marine Engineering Co., Limited, of Wallsend, and consists of a set of their most recently-designed engines, with cylinders 23 in., 38 in., and 61 in., by 39 in.; two steel boilers 14 ft. 9 in. by 10 ft. During the construction the steamer and machinery have been superintended by Mr. Joseph

Lewis, of Belfast, on behalf of the owners. On leaving the ways the vessel was christened the *Thornley* by Mrs. Rea, who, together with Mr. Rea, travelled especially from Belfast for the purpose.

Pannonia. — On Monday, June 22nd, Messrs. Wigham Richardson & Co. launched from their Neptune shipyard a very finely-modelled steel screw steamer, which they are building to the order of the Ungaro-Croata Steam Navigation Co., of Fiume, for their fast passenger service from Fiume along the coast of Dalmatia. The steamer is 220 ft. in length by 29 ft. beam, and is being constructed to take the highest class in Lloyd's Register. She will be provided with a very highly-finished accommodation for a large number of passengers, including a handsome dining-saloon and first-class state-rooms in the 'tween decks aft, with smoking-room and entrance hall above them. The vessel is to be fitted with quadruple expansion engines, self-balanced on the well-known Yarrow, Schlick & Tweedy system, which, with the boilers, are being constructed by Messrs. Wigham Richardson & Co., to give a speed of 15 knots per hour. Amongst the company present at the launch were Mr. and Mrs. Dendy, Mr. Mouton (superintending engineer), and Captain Baccarcich (representing the Ungaro-Croata Steam Navigation Co.), Mr. Alex. Rolland, Mr. Richardson, Mr. Christie, and Mr. and Mrs. Tweedy. As the vessel left the ways she was named the *Pannonia*, the ceremony being gracefully performed by Mrs. Dendy, of Newcastle-on-Tyne.

Leonis.—On Thursday, June 25th, Messrs. Furness, Withy & Co., Limited, launched from their shipbuilding yard at Hartlepool, a large steel screw steamer, built to the order of Captain Blacklin, West Hartlepool. She is a fine type of a modern cargo boat, measuring over 310 ft. in length, and built throughout of Siemens-Martin steel, with a large measurement and deadweight capacity, and built to the highest class at Lloyd's. The vessel is of the partial awning-deck type, with a raised quarter deck. The lower holds are fitted with wood grain divisions and the 'tween decks with iron grain divisions throughout, and all decks, deck erections, skylights, bulwarks, bulkheads, &c., are constructed of steel and iron. Cellular double bottom, fitted all fore-and-aft for water ballast, the after peak being also available as a tank. The greater portion of the plates are in 24 ft. lengths, making the structure of the ship very strong. Four steam winches, two donkey boilers, patent steam steering-gear amidships, screw gear aft, direct steam patent windlass, stockless anchors hauling into hawse pipes, and other modern appliances are fitted for the handy working of the vessel. The saloon and cabin providing accommodation for the captain, &c., is handsomely finished in polished hardwood. The steamer will be rigged as a two-masted fore-and-aft schooner, and has been constructed under the personal supervision of Captain Blacklin. She will be fitted with triple-expansion engines of massive design with every provision for economical working by Messrs. T. Richardson & Sons, Limited, Hartlepool. On leaving the ways she was gracefully christened *Leonis*, by Miss Ivy Blacklin.

LAUNCHES.—Scotch.

Spero.—On May 13th the *Spero*, a steel schooner-rigged steamer of about 1,200 tons gross, was launched at Dumbarton, owned by Messrs. T. Wilson, Sons & Co., Limited, Port of Registry, Hull.

Chilian Cruiser.—On May 26th Messrs. John Reid & Co., Limited, Whiteinch, launched one of five small cruisers which they have built for the Chilian Government coast service.

Christiana.—On May 26th Messrs. John Fullerton & Co. launched at Paisley a steel screw steamer of about 300 tons gross measurement, which has been built to the order of Mr. Robert Owen, Liverpool, for the Carnarvon and Menai Straits passenger and general cargo trade, and for which the steamer has been specially designed and constructed, having steam steering gear and all other modern appliances for working the ship and cargo. Compound engines of 250 H.P. will be supplied by Messrs. Hall-Brown, Buttery & Co., Govan. The steamer was named *Christiana*, the ceremony being gracefully performed by Miss Christiana Roberts, Bronyraig, Corwen, North Wales. Captain Griffiths is to command the vessel.

Musselcrag.—On May 26th a three-masted barque, named *Musselcrag*, was launched at Port-Glasgow by Messrs. William Hamilton & Co. She is a vessel of 1,985 tons register, of 3,400 tons deadweight carrying capacity, and of the following dimensions:—266 ft. by 40 ft. by 25 ft. She has been built under the superintendence of Captain Summers to the order of Mr. David Corsar, of Liverpool and Arbroath, and will be commanded by Captain Vaughan.

Benvorlich.—On Wednesday, May 27th, Messrs. Alex. Stephen & Sons launched from their works at Linthouse a beautifully modelled steel screw steamer, built to the order of Messrs. Wm. Thomson & Co., Leith, for their well-known "Ben" line of China and Japan traders. She has been constructed under Lloyd's supervision for their highest class of 100 A1 three-deck rule and to Board of Trade requirements for passenger certificate, and is of the following dimensions:—Length between perpendiculars, 345 ft.; breadth, extreme 43¼ ft.; depth, moulded, 27½ ft. The deck erections consist of full poop, bridge deck, enclosing engine and boiler casing, and topgallant forecastle. She has been constructed with a cellular double bottom for water ballast, has six steam winches, steam capstan windlass, steam steering gear, and all the latest and most approved appliances for the efficient and economical handling of a ship and cargo. She will be rigged as a two-masted schooner with fidding topmasts, and like all the steamers of this line she has now the uncommon but graceful cutwater bow surmounted with a handsomely carved classical female figure-head, giving her quite a yacht-like appearance in the water. Accommodation is provided under bridge deck at fore end, for saloon and spare staterooms. The captain's room is in house on deck, which forms saloon entrance, and the officers and engineers are located under bridge at after end, all apartments being fitted up in a substantial and comfortable manner. The crew, as usual, are berthed under the topgallant forecastle. The engines, which were fitted on board before launching, are of the most improved triple-expansion type, cylinders 25 in., 41 in., and 67 in. diameter, by 45 in. stroke, steam being supplied at 160 lbs. pressure by two extra large single-ended steel boilers, having four furnaces in each, and is fitted with patent feed-water filters by the Glasgow Patents Co., Limited. She is the seventh steamer built by Messrs. Stephen for this line, and as she left the ways was gracefully named *Benvorlich* by Miss Euphemia Clark, daughter of Captain John H. Clark, who takes command of the vessel.

Frontier.—On May 27th Messrs. Ramage & Ferguson, Limited, launched a twin-screw steel steamer for cargo and towing purposes, built to the order of Messrs. Dyer & Dyer, London, for the United Boating Co. at East London, South Africa. The steamer is fitted with two sets of compound-engines capable of driving the vessel nine knots loaded. The cargo capacity is 120 tons on 7 ft. mean draught. In addition to her towing gear the vessel is fitted with two steam winches and two cargo holds, with every facility for quick despatch of cargo. The cabins are on deck under the promenade deck, and are suitably fitted up for passengers. The vessel was named *Frontier* by Mrs. J. T. Ramage, St. Aubyns, and the owners were represented by Mr. George Scott, of Messrs. Donald, Currie & Co., who inspected the steamer during construction. The *Frontier* will leave Leith for South Africa about the end of June under the command of Captain McIntyre, who has had great experience in taking similar vessels to South Africa.

Denton Grange.—On May 27th a further addition was made to the fleet owned by Messrs. Houlder, Brothers & Co., London, by the launch of a screw steamer from Messrs. Workman, Clark & Co.'s shipyard at Belfast. The vessel was named the *Denton Grange* by Mrs. Alfred Houlder, of Holmwood, Purley, Surrey, in the presence of a large assemblage.

Augsburg.—On May 27th Messrs. Charles Connell & Co., Whiteinch, launched from their Scotstoun Shipbuilding Yard a large steel screw steamer, built to the order of Messrs. The Deutsche Australische Dampfschiffs Gesellschaft, Hamburg. Her dimensions are:—Length, 380 ft.; breadth, 46 ft. 6 in.; depth, moulded, 31 ft., with a deadweight carrying capacity of about 6,500 tons. She has been built to Lloyd's highest class as an improved spar-deck steamer, with cellular double bottom right fore and aft for water ballast, and is fitted with all the most approved appliances for the safety and efficient working of the vessel. The engines, which are of the triple-expansion type, are being constructed by Messrs. David Rowan & Son, engineers, Glasgow, to drive the vessel at a speed of 11 knots.

As the steamer left the ways she was named *Augsburg* by Mrs. Saggau, wife of Captain Saggau.

Sandbeck.—On May 27th Messrs. Lobnitz & Co., Limited, launched from their yard at Renfrew the twin-screw steamer *Sandbeck*, built for service on the West Coast of Africa. The vessel, which is of light draft, is specially constructed for navigating the rivers, and is similar to a vessel built three years ago by this firm for the same service.

Steel Screw Tug.—On May 28th Messrs. Fleming & Ferguson, Limited, shipbuilders and engineers, Paisley, launched from their yard a powerful steel screw tug steamer, built to the order of the British Admiralty, and is the third of four such vessels ordered by the Admiralty with this firm. As the vessel left the ways the naming ceremony was performed by Miss May Smith, Partick. At the launch the Admiralty were represented by Messrs. Hay, Stewart, and Scoggins.

Duchess of York.—On May 28th Messrs. Barclay, Curle & Co., Limited, launched from their building yard, Clydeholm, Glasgow, the smart looking saloon paddle steamer *Duchess of York*, built to the order of the Southampton, Isle of Wight, and South of England Royal Mail Steam Packet Co., Limited, and intended for excursion service in the Solent. The vessel is built to Board of Trade passenger requirements. The first-class passengers will be accommodated in handsome saloon abaft machinery space, with ladies' cabin on main deck, and a commodious dining-room has been arranged underneath with bar, pantries, steam carving tables, &c. Both upper saloon and dining-room will be elegantly furnished and upholstered in the latest style. The saloon for the second-class is fitted forward below deck. The steamer will be supplied with all modern requisites for the comfort and safety of passengers, and will be a handsome addition to the already large fleet of the company. While under construction the vessel and machinery were under the personal charge of Mr. Brown, the company's marine superintendent. The vessel's dimensions are 185 ft. by 22 ft. by 8 ft. 9 in., and measures about 250 tons gross. The naming ceremony was performed by Miss Brown, 2, Vectis Terrace, Southampton, daughter of the company's marine superintendent. After the launch the steamer was towed to the crane to receive her machinery, which is being supplied by the builders' firm, the engines being compound diagonal with H.P. cylinder of 24 in. diameter and low pressure cylinder of 45 in. with 54 in. stroke of piston. It is expected that the *Duchess of York* will be the fastest steamer in the company's service. We may add that the *Duchess of York*, which is the thirteenth vessel built and engined by Barclay, Curle & Co., Limited, for the company was only contracted for in the middle of February last, and is expected to be ready for service by end of June.

La Plata.—On May 28th an important addition was made to the fleet of the Royal Mail Steam Packet Co., when Messrs. R. Napier & Sons, Limited, launched from their shipbuilding yard at Govan the first of three steel screw steamships which they have on hand for the same owners. These fine vessels have been specially designed to meet the requirements of the company's extra service to Brazil and the River Plate, and are intended to carry a large cargo, with comfortable accommodation for first-class passengers and emigrants. The general dimensions are:—Length, 345 ft.; breadth, 44 ft.; depth, 27 ft.; with a topgallant forecastle, long bridge, full poop, and a gross tonnage of about 3,150 tons. The new steamer is built of steel, to class 100 A1 at Lloyd's, under special survey, and is fitted in accordance with the Board of Trade regulations for passenger steamers. The upper deck and fittings are of teak, and the most modern appliances have been supplied for the efficient working of the ship and the rapid handling of cargo. There is a complete installation of electric lighting throughout the vessel, and refrigerating machinery on the carbonic anhydride system, with chambers of 7,700 cubic feet capacity for the transport of frozen meat, &c. Superior accommodation has been provided amidships for the first-class passengers, and as the ships are intended to trade in tropical climates, the large and roomy state-rooms have been placed on the upper deck, which admits of perfect ventilation, and are furnished with all the latest improvements for the comfort of the passengers. Above, on the bridge deck, is a handsome dining saloon, finished in polished hardwood, with large sidelights, while overhead an awning deck forms an admirable shelter, and the bridge deck affords a spacious promenade for the first-class passengers. Very comfortable accommodation has been supplied for 700 emigrants on the main deck, with hospitals and a dispensary in the poop; while the officers' quarters have had special consideration bestowed on them. The machinery consists of a set of triple-expansion engines, with three steel boilers for a working pressure of 180 lbs., and is fitted with the most modern appliances for efficiency and economy. The vessel was gracefully named the *La Plata* by Mrs. James Hamilton, and after a successful launch was towed up the harbour to receive her machinery, which has been constructed at the builders' Lancefield Engine Works. The company in the meantime adjourned to the model-room, where success to the ship and continued prosperity to the owners' company was proposed by Mr. James Hamilton, who in the course of his remarks said there had been wonderful developments in the art of shipbuilding since they had built the *Shannon* for the same owners many years ago. In every new ship new problems had to be solved, and the Royal Mail Steam Packet Co. had always encouraged builders to strive for still greater success in solving these. They had been quick to seize upon modern improvements in engineering, having early adopted triple expansion engines, and the plan of having carrying capacity accommodation in front of the machinery—the latter one of the great modern improvements in shipbuilding. In different respects they had gone beyond the requirements of Lloyd's or the Board of Trade, more especially in the way of increased comforts for passengers. The *La Plata* included all the suggestions of the Parliamentary Bulkheads Committee in regard to the means that should be taken to prevent loss of life. While not desiring to make any reflection on the Board of Trade, he thought that a company that built and owned vessels like the *La Plata* ought to be absolved from all kinds of interference. The Right Hon. Sir James Fergusson, in replying, said they had always found the firm of Robert Napier & Sons one of the best on the Clyde. He hoped the ship's future career would be as successful as her launch had been. The arrangements had worked as smoothly as could be desired, and reflected great credit on the builders. He was sorry that his daughter, Mrs. J. G. A. Baird, had not been present to perform the christening ceremony, but her place had been well filled by Mrs. Hamilton. In proposing "Success to the Builders," he hoped the stocks vacated by the *La Plata* would soon be refilled, and that the firm would continue to hold its own on the river. Mr. John Hamilton replied. Other toasts followed, including the health of Mrs. Hamilton and that of Mr. Arthur, of the Royal Mail Steam Packet Co.

Hornby.—On May 29th Mr. D. M. Cumming, Blackhill Dock, launched the *Hornby*, a steel screw lighter. A pair of high-pressure diagonal engines, 9 in. diameter, by 12 in. stroke, are being fitted by Messrs. Shanks, Morrice & Co., Pollokshaws.

Guardian.—On May 30th there was launched from the shipyard of Messrs. Cumming & Ellis, shipbuilders, Inverkeithing, a handsomely-modelled steel screw steamer of the following dimensions: 146 ft. by 23 ft. 9 in. by 10 ft. 1½ in. moulded. The vessel is of the raised quarterdeck type, having three masts, the engines being aft. The bottom has been specially strengthened to enable the vessel to take the ground in a tidal harbour, heavy elm rubbing fenders have been fitted round sides of vessel to protect shell, and is fitted with all the latest appliances for easy handling in harbour and at sea, and for rapid loading and discharging of cargo, which include steam windlass, steam capstan, steam winches, steam steering gear, &c. The vessel has been built to class 100 A1 at Lloyd's under special survey. Powerful engines will be fitted by Messrs. Clyne, Mitchell & Co., Aberdeen, which will drive the vessel at a high rate of speed. As the vessel left the ways she was gracefully named the *Guardian* by Miss Marie Ellis. The vessel is built to the order of Messrs. Bain, Sons & Co., Portreath, near Redruth, Cornwall.

Taormina.—On May 30th Messrs. R. Duncan & Co. launched at Port-Glasgow, a steel screw steamer for Mr. Jorgen C. Knudsen, Porsgrund, Norway, of 250 ft. in length by 35 ft. by 26 ft. The vessel was named *Taormina* by Miss Duncan, Ardenclutha. Triple-expansion engines of 900 I.H.P. will be supplied by Messrs. Muir & Houston, Glasgow.

Wakatere.—On Saturday, May 30th, Messrs. Napier, Shanks & Bell, Yoker, launched the saloon paddle steamer *Wakatere*, which has been built for the Northern Steamship Co. of Auckland, N.Z. The *Wakatere* has been specially designed for passenger service, with a limited cargo capacity, on light draft, and is similar in general arrangement to the most modern type of Clyde coasting steamers, having also various additions and improvements to fit the vessel as perfectly as possible for her future service. The promenade deck, extending the full width of the vessel, is carried from stem to stern. The entire space under deck aft (embracing dining saloon, main saloon, and ladies' cabin, &c.,) is fitted for first-class passengers, while accommodation is also provided forward for second-class passengers. The machinery, consisting of direct acting diagonal engines, with cylindrical tubular boilers adapted for forced draught, will be supplied by Messrs. Bow, M'Lachlan & Co., Paisley. The vessel was named *Wakatere* by Miss Melville, daughter of Mr. Thomas Melville, a director of the company, who was also present at the launch, the owners further being represented by Mr. John Darling, the superintendent over the vessel's construction, and Mrs. and Miss Darling; also Mr. and Mrs. Coutts, and Captain Farquhar and Mr. Farquhar, from Auckland.

Kirkham.—On June 2nd Messrs. Murdoch & Murray launched a vessel for the Lancashire and Yorkshire and London and North Western Railway Co., to be used for the improvement of Fleetwood Harbour. The vessel is a twin-screw steamer 136 ft. long by 25 ft. wide by 9 ft. 6 in. deep; is fitted as a hopper barge, and will have a crane and grab bucket forward for cleaning out harbour, and is also fitted with one of Gwynne's sand pumps. The propelling machinery will be supplied by Messrs. Rankin & Blackmore, Greenock, and will consist of their four cylinder triple-expansion disconnecting twin-screw engines, and is the ninth vessel engined by the above firm for the same owners. On leaving the ways the vessel was named *Kirkham*, by Mrs. Hunt, of Fleetwood.

Mamoria.—On June 4th Messrs. Russell & Co., Port-Glasgow, launched a steel screw steamer named *Mamoria*, for passenger service on the River Amazon. This steamer is to the order of Messrs. E. A. Da Costa & Co., Liverpool, and will be supplied with triple-expansion engines by Messrs. Kincaid & Co., Greenock.

Steel Screw Tug.—On June 5th Messrs. Fleming & Ferguson, Limited, shipbuilders and engineers, Paisley, launched from their yard a powerful steel screw tug steamer, built to the order of the British Admiralty, being the last of four such vessels ordered by the Admiralty of this firm.

County of Fife.—On June 11th Messrs. Hawthorne & Co., Limited, launched from their yard at Leith the first of three steam line fishing vessels for companies recently formed in Anstruther. The vessel is very finely modelled, and her dimensions are 90 ft. long by 19 ft. by 10 ft. 6 in. moulded. She will be propelled by C.S.E. engines, supplied with steam by a boiler working at 120 lbs. pressure per square inch, also constructed by the builders. She is fitted with all the latest and most approved appliances for a vessel of her class. As she left the ways she was named *County of Fife* by Miss Sprott, daughter of Major Sprott, of Strathvithie.

John Herron.—On Friday, June 12th, Messrs. John Scott & Co., of Kinghorn, launched the first of the two new paddle steamers which they are building to the orders of the Wallasay Urban District Council, under the superintendence of Messrs. Flannery & Tritton, consulting engineers of Liverpool and London. These vessels are 160 ft. overall by 27 ft. beam by 10 ft. 6 in. depth, moulded. They have been built with all the latest improvements, and have been so arranged that the funnel stands amidships, and gives two long unbroken saloons fore and aft, and there is no obstruction by the funnels in the gangways. The vessels are fitted with two rudders and steam steering gear, the levers for the same are grouped together with the telegraphs in a convenient position at the mate's platform, which is situated forward of the funnel, and gives the steersman an uninterrupted view ahead. The vessels are constructed to carry 1,500 passengers on a very light draught of water, and to maintain a higher rate of speed than the present vessels engaged in the same service. The comfort and convenience of the passengers have been especially considered, the saloons being thoroughly heated and ventilated, and tastefully decorated. As the vessel left the ways she was named the *John Herron*, in honour of the chairman of the Ferry Committee, by Mrs. Finch, the wife of Mr. F. Finch, of the firm of A. Bellbourough & Co., of Lloyd's. The chairman and a large company of ladies and gentlemen were present at the launch. The vessel will shortly proceed upon her official trials, and take her station on the Mersey.

Rob Roy.—On Saturday, June 13th, from the Ailsa Shipbuilding Co.'s yard at Troon, a steel screw-steamer for Messrs. William M'Lachlan & Co., of Glasgow, was launched. She measures 100 ft. in length; 18 ft. in breadth; and 9 ft. 2 in. deep. She has been built under special survey, and is to be classed A1 at Lloyd's, and is to be fitted with compound engines, 14 in. and 30 in. cylinders by 21 in. stroke, by Messrs. Muir & Houston, Limited. She was named the *Rob Roy* by Miss Inglis, Glasgow, and is to be employed in the fish carrying trade, making the thirteenth built for the Messrs. M'Lachlan.

Margarita.—On Saturday, June 13th, the Ailsa Shipbuilding Co., Troon, launched from their yard a very handsomely modelled twin-screw steam yacht for Mr. Anthony J. Drexel, of Philadelphia. She was designed by Mr. G. L. Watson, and has been built under his superintendence. The following are her dimensions:—Length over figure and taffrail, 280 ft.; length, between perpendiculars, 246 ft.; breadth, moulded, 33 ft. 6 in.; depth, 20 ft.; tonnage, yacht measure, 1,350 tons. She is built of steel to the highest class in Lloyd's Yacht Register, has topgallant forecastle and shade deck, and is schooner rigged with two polemasts. Her sails, and a complete set of double awnings fore and aft, will be supplied by Lapthorn & Ratsey. In the forward part of ship there is a large dining saloon surmounted by a beautiful dome, filled in with richly stained glass, and there are three large state-rooms, children's room, pantry, and bath-rooms. In the after part is situated the owner's stateroom, which is a splendid apartment, extending the whole width of ship, with dressing and bath-rooms communicating. Abaft of this there is a long passage-way with guests' rooms, doctor's room, bath-room, maid's room, and wardrobe room on either side of same. On main deck amidships there is a large range of houses, the middle portion being occupied by laundries, saloon galley, boot-room, drying-room, and other offices, and at the fore end captain's room, and companion way. At the extreme fore end is a large cabin beautifully fitted up as a library, and at the after end a boudoir or drawing-room. The cabins and state-rooms are being fitted up in the richest style of joiner and cabinet work, principally in polished mahogany. Messrs. Wylie & Lochhead are fitting the upholstery, and throughout it is of the most sumptuous and *recherche* character. The machinery is being constructed by Messrs. David Rowan & Son, and consists of two distinct sets of quadruple-expansion engines, each having four cranks, and to work at a steam pressure of 200 lbs. per. square inch. She has two steam launches and two racing cutters, besides the usual complement of boats on davits. The vessel was named the *Margarita* by Mrs. Watson, the respected mother of the designer of the yacht.

Victoria.—On June 15th was launched the steamer *Victoria* which has been built by Messrs. James & George Thomson, Limited, Clydebank, for the London and South-Western Railway Co.'s passenger service between the Channel Islands and the coast of France. The vessel is 220 ft. in length between perpendiculars; 28 ft. in breadth: and 17 ft. deep, and will have a gross tonnage of 700 tons. In appearance and arrangement she will be somewhat similar to the *Columbia* and *Ailsa*, built by Messrs. Thomson for the same owners in 1894, the accommodation for the first-class passengers being arranged on the main and promenade decks amidships, and for the second-class aft. The machinery will consist of two sets of triple-expansion engines, and the vessel will be provided with steam steering engine, steam windlass, steam warping engine, and electric light throughout, and will have all the latest improvements for the working of the ship, as well as for the comfort of the passengers. The naming was performed by Miss Dunlop, Dowanhill; and amongst those present at the launch were Mr. John Dixon, marine superintendent of the London and South-Western Railway Co.; J. Parker Smith, Esq., M.P.; Messrs. James R. and George B. Thomson, and Admiral M'Clure, Chinese Navy.

Slaney.—On June 16th Messrs. Wm. Simons & Co., Limited, Renfrew, launched complete a single-screw hopper dredger constructed to the order of the Wexford Harbour Commissioners. This vessel is of the following dimensions:—Length, 120 ft.; breadth, 28 ft.,; depth, 10 ft. 6 in. The *Slaney* is capable of carrying 250 tons deadweight, and is propelled by one pair of triple surface-condensing engines of I.H.P. sufficient to propel the vessel, when fully loaded, at a speed of seven knots per hour. The hopper compartments are provided on each sides of well, having all the necessary gear for lifting and lowering the hopper doors. A steam crane is provided at after end of hopper for emptying the hopper when filled with ballast.

Chile.—On Saturday morning, June 20th, Messrs. Caird & Co., shipbuilders, Greenock, launched a twin-screw steamer, built to the order of the Pacific Steam Navigation Co. The vessel, which was named the *Chile*, is of 2,800 tons gross weight. She is 350 ft. in length, 43 ft. deep, moulded, and 23 ft. 3 in. in breadth amidships. The *Chile*, which is to have a guaranteed speed of 13 knots, will be fitted up in a first-class manner for the company's cattle, cargo, and passenger traffic between Valparaiso and Panama. The steam winches, windlasses, and capstans onboard are by Wilson, Liverpool, and the steam steering gear is by the Harrison Engine Co.

Glenholm.—On June 24th Messrs. A. Rodger & Co., shipbuilders, Port-Glasgow, launched for the Glen Shipping Co., Glasgow, a full-rigged three-masted steel sailing ship, of about 1,800 tons register, to carry about 3,300 tons deadweight. The dimensions are:—Length, 266 ft.; breadth, 40 ft.; depth, 23 ft. 6 in. Miss Boughton-Leigh, Rugby, gracefully performed the ceremony of naming the vessel *Glenholm*. There were present at the launch:—Miss K. Russell, The Knowe; the Misses Greschotti, Glasgow; Provost Rodger, Messrs. Joseph Russell, J. H. Hutchison, Captain and Mrs. Longmuir, Mr. Stirling, managing owner of the Glen Line, and others. The *Glenholm* will load ballast at Port-Glasgow for New York.

Parmelia.—On June 25th Messrs. Wm. Simons & Co., Limited, Renfrew, launched complete the *Parmelia*, a steel twin-screw hopper dredger, constructed to the order of the Government of Western Australia. The vessel, which is to be employed at Fremantle, Western Australia, was built under the direction of Messrs. Coode, Son & Matthews, C.E., Westminster; Mr. Wilson Wingate, N.A., being inspecting engineer. It has a capacity to carry 500 tons of dredgings, and the buckets are of ample capacity to raise 400 tons of free soil per hour. This dredger works to a depth of 35 ft. of water, has two pairs of triple-expansion engines of 800 I.H.P., each driving its own propeller. Two steel boilers of 160 lbs. working pressure supply the steam. The hopper doors are worked by steam and hand gear. Powerful triple-barrelled steam mooring winches are provided, each barrel working independently or conjointly, as required. The vessel is lighted throughout by electricity, comfortable cabins are provided for the officers and the crew. This is the second dredger Messrs. Wm. Simons & Co., Limited, have constructed for the Western Australian Government.

LAUNCH—IRISH.

China.—On June 13th there was launched from the Queen's Island yard of Messrs. Harland & Wolff the P. & O. ship *China*. The launch was timed for eleven o'clock, and punctually at that hour the magnificent vessel began to move along the launch ways, and a few minutes later entered the river opposite the Belfast shipyard. The launch took place without the slightest hitch. The *China* is the fifth steamer built on the Queen's Island for this company, and is 500 ft. in length by 54 ft. beam. She will have two masts, and be schooner rigged. Her gross tonnage is about 8,550, and she will be propelled by a single set of triple-expansion engines of 7,500 I.H.P., which are being constructed by the builders of the vessel at their engine works at the Abercorn Basin. The captain's and officers' cabins, the chart-room, and wheel-house are on the boat deck, and the accommodation for first and second-class passengers—of which she will carry a large number—on the hurricane, spar, poop, main, and lower decks. The ship will be fitted as a first-class mail and passenger steamer, and will have a full installation of electric light, also refrigerating chambers for cargo and stores, hydraulic deck machinery, &c. After the launch had taken place, Messrs. Taylor & Petticrew, representing the P. & O. Co., expressed themselves satisfied in every respect with the arrangements for same, and also for the manner in which the vessel had been constructed. Mr. Walter H. Wilson represented the firm of Messrs. Harland & Wolff on the occasion, and it may be added that the *China* will be ready for sea in about three months time.

LAUNCH.—NORWEGIAN.

Bhandara.—On June 4th the *Bhandara*, built by the Flensburg Shipbuilding Co. for the Hamburg Calcutta Line, was launched. Her dimensions are:—420 ft. by 50 ft. by 33 ft. Her engines are in construction in the engine department of the Flensburg Shipbuilding Co.

TRIAL TRIPS.

Rolando.—The steam trawler *Rolando*, the latest addition to the Grimsby fleet, has lately had her trial trip. She was built to the order of Mr. G. F. Sleight, of Grimsby, and the hull was constructed by Cochrane & Cooper, of Beverley; and the machinery, of 40 N.H.P., has been fitted by C. D. Holmes & Co., of Hull. The *Rolando* left Hull at 4 a.m., and proceeded down the river to Grimsby, and then proceeded out to sea as far as Bridlington. During the whole of the run the engines worked without a hitch, and the sea-going qualities of the vessel were all that could be desired.

Quarta.—On May 11th a steel screw steamer, built by the Flensburg Shipbuilding Co., to the order of the Steamship Co. of 1869, in Flensburg, was taken on trial trip. Her dimensions are:—271 ft. 38 ft., by 23 ft. 6 in., with engines 900 H.P. Her average speed was 11½ knots.

Barcellos.—On May 21st the twin-screw steamer *Barcellos*, built by Messrs. A. Rodgers & Co., Port-Glasgow, and engined by Messrs. Hall-Brown, Buttery & Co., Govan, was successfully tried on the measured mile in the Gareloch, when a speed o 10½ knots was easily obtained. This vessel is a sister ship to the *Sapucaia*, both being owned by the Amazon Steam Navigation Co., London, and built under the superintendence of Mr. James Pollock, their engineer. The vessels are fitted with all the latest improvements for the special trade in which they will be engaged. The dimensions are 170 ft. by 28 ft. by 10 ft. 6 in., and on trial the vessel was fully loaded with coal. The engines are on the triple-expansion principle, working at a pressure of 165 lbs.

Baron Innerdale.—On May 21st the s.s. *Baron Innerdale*, recently built to the order of Mr. Hugh Hogarth, of Glasgow and Ardrossan, by Messrs. A. Rodger & Co., Port-Glasgow, went her trial trip. She is a vessel of 3,340 tons gross, and of the following dimensions:—Length, 335 ft.; breadth, 43 ft. 6 in.; depth, 28 ft. 9 in. Her machinery has been supplied by Messrs. Dunsmuir & Jackson, Govan, and consists of a set of triple-expansion engines, having cylinders 25 in., 40 in., and 66 in. diameter, stroke 45 in., with two single-ended boilers fitted with Howden's forced draught; working pressure, 170 lbs. She is supplied with a full complement of winches, &c., for the speedy and efficient handling of cargo, and is fitted up throughout in a first-class manner. The vessel steamed down the Firth towards Ailsa Craig, and throughout the trial the working of the machinery and the speed attained was most satisfactory. The same afternoon the vessel proceeded to Cardiff to load coal for Java.

Veva.—On Thursday, May 21st, the s.s. *Veva*, built by Messrs. Ropner & Son, of Stockton-on-Tees, to the order of Messrs. G. Pyman & Co., of West Hartlepool, made her official trial trip. The steamer proceeded down the river to the Tees Bay, where her compasses were duly adjusted, after which a very pleasant and satisfactory run was made at sea, the engines working very efficiently and steaming easily. The owners were represented by Captain Pyman, who has superintended the building and fitting out of the steamer, and who expressed himself as highly satisfied with the performance of the vessel At the conclusion of the trial trip the steamer proceeded on her way to Hull, where she loads for the River Plate.

Loongmoon.—On May 23rd the new steamer *Loongmoon*, which has been built by Messrs. Wigham Richardson & Co., of Low Walker-on-Tyne, for the Chinesische Kustenfahrt Gesellschaft, of Hamburg, completed a satisfactory trial trip. The vessel is built of steel, is 310 ft. in length by 38½ ft. beam, is rigged as a two-masted schooner, and has been built to take the highest class in the registries of the Bureau Veritas and Germanischer Lloyd. She has been specially constructed for the eastern coasting service of this company. The engines and boilers have been constructed by Messrs. Wigham Richardson & Co., the former being of the quadruple type, self-balanced on the Yarrow, Schlick and Tweedy system. During the trial trip they worked satisfactorily, driving the vessel at a speed of 12½ knots.

Asturia.—On Saturday morning, May 23rd, the s.s. *Asturia*, built by Palmer's Shipbuilding and Iron Co., Limited, to the order of the Hamburg-American Steam Navigation Co of Hamburg, was taken to sea for her o[illegible] dimensions are as follows:—Length [illegible]

390 ft.; beam, 53 ft.; depth, moulded, about 29 ft. The vessel is rigged as a two-masted fore-and-aft schooner, and has been constructed under special survey to obtain German Lloyd's highest class; and is of the three-deck type, with a combined poop and bridge extending to after end of main hatch, and a topgallant forecastle. The main and upper decks are of steel all fore and aft, and all the exposed decks are sheathed with wood. A double bottom for water ballast is fitted all fore and aft, and divided at the centre line for the purpose of assisting to trim the vessel, a separate system of piping being fitted on each side of centre line division, enabling each compartment to be filled and emptied independently. The vessel has been designed for the emigrant, cattle and general cargo trade, and is lighted throughout by electricity, and fitted complete with all the latest improvements for this service. The accommodation for the captain, officers, engineers and also galleys and emigrants' hospitals, &c., are in the deck houses on the top of the bridge and in side houses in fore end of bridge, and also part of the lower 'tween deck aft is fitted with accommodation for 300 or 400 emigrants. The emigrants' berths are of Hoskins' latest patent, and are fitted along each side in separate rooms for 10 persons each, the centre of the deck being left clear for the table, seats, &c. The whole of the fittings are portable, and the space may thus be readily converted for carrying cattle or general cargo. The remainder of the 'tween decks, not occupied by emigrants, is fitted for cattle, and a complete system of water service, sidelights, fan ventilators, &c., are supplied and fitted as in first-class cattle boats. A small insulated space is fitted in the lower hold aft with refrigerating machinery, &c., complete for stowing ice, vegetables and meat for the use of the emigrants and crew. The remainder of space in lower holds is fitted for general cargo, and a complete system of steam winches, derricks and steam cranes for the efficient working of general cargoes, are fitted. The engines, which are also built by the Palmer's Co., are of the triple-expansion type, with cylinders 27 in., 45½ in., 74 in. and 48 in. stroke, steam being supplied by three single-ended boilers, 15 ft. 9 in. diameter, and 11 ft. long; working pressure of steam 180 lbs. All modern apparatus and appliances for the most efficient and economical working are fitted, and the whole of the vessel and machinery is constructed to meet the requirements of the German emigrant service. During the trial the engines worked for a considerable time in a satisfactory manner at 78 revolutions per minute, and a mean speed of 12½ knots was attained on the measured mile.

Talisman.—On May 26th the saloon steamer *Talisman*, the most recent addition to the fleet of the North British Steam Packet Co., made a trial trip on the river. The vessel, which is one of the most handsome passenger steamers on the Clyde, was built by Messrs. A. & J. Inglis, and was placed on the passage between Craigendoran and Rothesay. She has been specially designed with a view to rapid sailing and the comfort of her passengers. Her length is 215 ft., and she is 23 ft. in breadth, by 8 ft. in depth, her tonnage being 290 tons. Her engines, which are also by Messrs. Inglis, are of the single diagonal surface condensing type, with a 52 in. cylinder and a 6 ft. stroke. She has been built to meet the Board of Trade requirements, and is certified to carry 1,254 persons. Leaving Craigendoran in delightful weather, shortly after noon, the ship, which was under the command of Captain M'Kinlay, crossed to the Cloch Lighthouse for the purpose of making a speed trial to the Cumbrae Light. The speed attained was 18·5 knots, equal to 21·3 statute miles an hour, a result which was regarded as highly satisfactory. The *Talisman* is a fine powerful steamer of her type, that steadily maintains a high rate of speed without being pressed, the only inconvenience being the slight pushing motion incidental to single engines, which in other respects appear to have everything to commend them. The vessel is only the second of the style the builders have turned out, so the result is all the more to their credit. Next year it is not improbable the N.B. fleet will add a larger type of vessel altogether, suitable for large excursion traffic, which seems to be growing year by year.

Langton Grange.—On Wednesday, May 27th, a further addition was made to the fleet owned by Messrs. Houlder Brothers & Co., of London, by the launch of a large screw steamer from Messrs. Workman, Clark & Co., Limited, shipyard. The vessel was named the *Denton Grange* by Mrs. Alfred Houlder, of Holmewood, Purley, Surrey, in the presence of a large assemblage. A party at the invitation of the builders then proceeded on board the *Langton Grange*, which proceeded down Belfast Lough on her trial trip. This vessel has been specially designed to suit the many requirements of Messrs. Houlder's trade to Australia, South America, and the Cape. The leading dimensions are:—Length, 420 ft.; breadth, 54 ft.; depth, 32 ft. 5 in, with a gross tonnage of 5,850, and built to Lloyd's highest class with Board of Trade requirements complied with for carrying passengers. The vessel is divided into eight compartments, and several of the holds are insulated, and the refrigerating machinery fitted up by Messrs. Hall, Dartford, Kent, on the carbonic-gas system. Eleven powerful steam winches of a special design having extended shafts with large barrels and frictional brakes are provided for working cargo, the derricks being suspended from steel derrick posts. Exceptional good stowage has been secured by dispensing with hold beams, and substituting continuous side stringers with a minimum projection. The upper deck is covered with erections for over three-quarters of the length, having on the bridge deck a large deck house for the passengers and officers. A complete installation of electric lighting has been fitted throughout, including arc lamps. Arrangements have been made for conveying cattle, and upwards of 700 can be carried on the upper decks. During the day the vessel was run on the measured mile, and an average speed of 13½ knots was attained. The machinery has also been constructed at the builders' works, and is capable of developing about 3,200 I H P. with steam supplied from three boilers, with Howden's forced draught, the superintending of this department being carried out by Messrs. Esplen, Son, & Swainston, and the supervision of the ship under Mr. Copeland K. Etheridge, Messrs. Houlder's marine superintendent.

Sir Evelyn Wood.—On May 27th the transport steamer *Sir Evelyn Wood*, recently built and engined by Messrs. Fleming & Ferguson, Limited, Paisley, went down the Clyde on her trial, and on a six hours' run attained a speed of 10 knots, being in excess of guaranteed speed, everything working smoothly and to the satisfaction of the Government officials on board.

Hermes.—On May 27th the new steamer *Hermes*, which has been built by Messrs. Wood, Skinner & Co., of Bill Quay, on Tyne, to the order of Messrs. Brunsgaard, Kjosterad & Co., of Drammen, went for her official speed trials off the mouth of the Tyne, which were in every way successful. A rather strong north-easterly wind was blowing, but an average speed of 11 knots was obtained. The vessel is of the following dimensions:—337 ft. by 35 ft. 2 in. by 17 ft. 9 in., and is fitted up with every modern appliance for economical working of both vessel and cargo. She has been built to the highest class of Det Norske Veritas and English Lloyd's, and is of the flush-deck type, and has a deadweight carrying capacity of 2,300 tons. The propelling machinery, which has been constructed by the North-Eastern Marine Engineering Co., Wallsend, consists of a set of triple-expansion engines, having cylinders 18½ in., 30 in., and 49 in., by 33 in. stroke, steam being supplied by one large steel boiler, working at 160 lbs. pressure. Amongst those present at the trial were Messrs. Wood & Skinner, the builders of the vessel, Mr. Lauritz M. Bodin, chief surveyor to Det Norske Veritas, Mr. Myles, representing the engine builders, and a number of others. After the completion of the trials the vessel proceeded to Middlesbrough under command of Captain J. C. Jensen, to load for Vladivostock.

Continente.—On May 30th the twin screw steamer *Continente*, built by Messrs. Murdoch & Murray, Port-Glasgow, and engined by Messrs. Lees, Anderson & Co., Glasgow, went down the Clyde on her official trial trip. The vessel has been built to Lloyd's highest class, and is intended for passenger and cargo service on the South American coast. She went through her speed trials at Skelmorlie, when a speed of over 12 knots was attained, this being considerably over the guarantee.

Flintshire.—On June 1st the new screw steamer *Flintshire*, being the second vessel built to the order of Messrs. Jenkins & Co., Limited, of London, for their Shire line of steamers, by the Sunderland Shipbuilding Co., Limited, was taken to sea for her official trial trip. The register length of the vessel is 364 ft.; breadth register, 45 ft. 3 in., and depth, moulded, 30 ft. 6 in., having large topgallant forecastle, in which are berthed the sailors and firemen, long bridge amidships, under which is provided accommodation for captain, engineers, officers, and a few passengers. The handsome saloon is tastefully fitted in polished oak, with tiled floor, and complete with every comfort. The full poop is entirely devoted to cargo. The vessel is constructed on the web frame principle, thus dispensing with hold beams, and has cellular water ballast all fore and aft. The poop and bridge decks are of wood, the main and spar decks of steel, and all frames are of zed steel. Her class will be 100 A1 Lloyd's, spar deck grade, special survey, also Board of Trade certificate. Her carrying capacity is 5,750 tons. The deck machinery consists of seven large steam winches, by Mr. R. Welford, Sunderland, direct steam windlass, by Messrs. Emerson, Walker & Co. Messrs. Roger & Co.'s steam steering gear (which is placed in the engine-room and worked from flying bridge), together with all the usual appliances for handling cargo and working the ship with the greatest possible despatch. The main engines are upon the tri-compound principle, by The North Eastern Marine Engineering Co., Limited, Sunderland, and have cylinders 25 in., 41½ in., and 69 in. by 45 in. stroke, steam being supplied by two large steel boilers working at a pressure of 180 lbs. per square inch. During construction the steamer has been inspected on behalf of the owners by Mr. C. E. Hudson. The trial trip was in every way most satisfactory, a mean speed of 12½ knots being obtained on the measured mile, after which the vessel left for Middlesbro', where she takes in the first portion of her cargo for Japan.

Kathleen.—On June 2nd the steam yacht *Kathleen*, 316 tons, belonging to Earl Fitzwilliam, which has recently been fitted with new triple-expansion machinery by Day, Summers & Co., of the Northam Iron Works, Southampton, went out for her trial trip, when the mean speed obtained on four runs at the measured mile in Stokes Bay was 11¾ knots. The diameters of the cylinders are 14 in., 21½ in. and 37 in. by 24 in. stroke, and the boiler is 11 ft. diameter, and 9 ft. 4 in. long, the working pressure being 150 lbs. This machinery is fitted into the same space as that occupied by the old machinery. The trial trip was in every way satisfactory, there being an entire absence of vibration, which was much complained of with the old engines, the speed also being much greater.

Wilhelmina.—On June 3rd the *Wilhelmina*, which was launched recently from the yard of Messrs. Short Brothers, Sunderland, and built to Rotterdam order, went out on trial, and after compasses were adjusted was run over the measured mile. After a series of runs a mean speed of 12½ knots was attained, which was considered very satisfactory, the engines working with perfect smoothness and absence of vibration, steam being easily maintained at a pressure of 180 lbs. She has been constructed in excess of Lloyd's requirements for the highest class, and is of the following dimensions:—Length, 314 ft.; breadth, 43 ft.; and depth, moulded, 23 ft. 10 in., with a deadweight carrying capacity of about 4,100 tons. The vessel is constructed on the cellular double-bottom principle, with deep framing in lieu of web frames or hold beams, and has a short full poop for the accommodation of captain and officers, &c., with saloon handsomely fitted in polished hardwoods. She is fitted with large multitubular donkey boiler of sufficient power to drive the powerful steam winches on deck simultaneously. A steam windlass is also fitted, steam steering gear amidships, and screw gear aft. Every attention has been paid to the fitting of all the latest appliances for the economical working of cargoes both for loading and discharging.

Jupiter.—On June 5th the s.s. *Jupiter* left the port of Hartlepool for her trial trip. She has been built by Messrs. Wm. Gray & Co., Limited, for Messrs. Schmidt & Hansen, Flensburg, and is a steamer intended for the timber and general cargo trades, is built to Lloyd's highest class, and of the following dimensions:—Length over all, 270 ft.; breadth 39 ft.; depth, 18 ft. 2 in. She has been supplied with triple-expansion engines from the Central Marine Engine Works of Wm. Gray & Co., Limited, the diameters of the cylinders being 19 in., 30½ in., and 51 in., with a piston stroke of 36 in., and steam is supplied by one large steel boiler working at a pressure of 160 lbs. per square inch. The vessel had on board a cargo of pig-iron and coal, and the trial which the ship and her machinery underwent was considered eminently satisfactory. The owners were represented by Mr Harold Casper and Captain Hohlmann; the shipbuilders by Captain Murrell; the engine builders by Mr. G. H. Baines and Mr. Lindsay; and there were also present Mr. J. T. Sinclair, of West Hartlepool, and Mr. Lucas, of Darlington. On the completion of the trial the vessel at once proceeded on her voyage to Flensburg, under the command of Captain Hohlmann.

Lord Kelvin.—On June 5th the steamer *Lord Kelvin*, which was recently launched by Messrs. Bartram & Son, of Sunderland, went on her trial trip. The vessel is owned by Messrs. John Herron & Co., Liverpool, and has been superintended during construction by Messrs. Flannery & Tritton, Liverpool and London. She is of the following dimensions:—Length, 350 ft.; breadth, 45 ft.; depth, moulded, 26 ft. 9 in., with a carrying capacity of 5,200 tons on a very light draught of water. She is fitted with evaporator, fresh water condenser, feed heater and other modern steam fittings, all of which were tried under working conditions with satisfactory results. The main engines, which had been supplied by Messrs. John Dickinson & Sons, Sunderland, have cylinders 24 in., 39½ in. and 65 in. by 42 in. stroke, and steam is supplied by two large single-ended boilers. The vessel was tried for several hours off the Tyne at full speed with most satisfactory results, the machinery working without the slightest hitch at 78 revolutions and steam being maintained with the greatest ease. Owing to the special arrangements devised with regard to funnel and ventilation, the draught was unusually good, and the stokehold and engine-room very cool. The vessel was tried for several runs over the measured mile, and although her light draught with propeller only half immersed made the conditions very unfavourable, she obtained a speed of upwards of 11½ knots. The turning powers of the vessel were also thoroughly tested and proved her very handy. The owners and a large company of ladies and gentlemen were present.

Hardy.—On June 6th the torpedo boat destroyer, built by Messrs. Doxford & Sons, of Sunderland, had her official full-power trials on the measured mile off the Maplin Sands. The speed stipulated for by the Admiralty is 26 knots, and the *Hardy* easily achieved a mean rate of 26·8 knots for six runs over the measured mile, and a mean speed of 26·514 knots for three hours' continuous steaming. The mean steam pressure in the boilers was 189 lbs. per square inch, and the mean revolutions were 360 per minute. The average I.H.P. developed by the engines during the trial was 4,184.

Simonside.—On Saturday morning, June 6th, the fine steel screw steamer *Simonside* went on her trial trip. She has been built by Messrs. Wm. Gray & Co., Limited, to the order of Messrs. J. & E. Kish, of Sunderland. She takes Lloyd's highest class, and is of the following dimensions:—Length over all 336 ft.; breadth, 47 ft.; depth, 24 ft. 10 in.; has a half poop, bridge over machinery space, topgallant forecastle, tasteful saloon and state rooms, together with captain and officers' rooms. The hull is built with web frames and double bottom under each hold for water ballast; there are six steam winches, steam steering gear amidships and screw gear aft, patent direct steam windlass, iron longitudinal grain divisions and stockless anchors. The engines are of the triple-expansion type, and have been supplied by the Central Marine Engine Works of Wm. Gray & Co., Limited. The cylinders are 24 in., 38 in. and 64 in. in diameter, with a piston stroke of 42 in. There are three large main boilers, of steel, working at a pressure of 160 lbs. per square inch. This arrangement enables donkey boilers to be dispensed with, as any one of the main boilers can be kept under steam for working the winches, windlass, &c. A Mudd's evaporator and tail shaft preserver sleeve are supplied, and the vessel is otherwise fully equipped with all the appliances carried by a first-class cargo boat. The owners, Messrs. J. & E. Kish, were on board, as also their superintendent, Mr. M. Metcalfe (under whose superintendence the vessel and her machinery have been constructed); Captain Murrell represented the shipbuilders, and Mr. James Lindsay the engine builders; there were also present Mr. C. L. Cummings, Mr. J. Wilson, Mr. H. Simpson, Captain W. L. Sinclair (who is in command of the vessel), and Mrs. Sinclair, the Misses Forster, and Mr. John Tulley. The trial was a thoroughly satisfactory one, the engines running with great smoothness, the bearings keeping perfectly cool, and the boilers and glands quite steamtight. Owing to the dense fog no speed trial was made. The vessel arrived at Sunderland at 8.30 p.m., where part of her company went on shore, the rest proceeding with the vessel to Barry Dock, where she loads for Port Said.

Larchwold.—Another addition has just been made to the Grimsby Steam Trawling fleet in the s.s. *Larchwold*, built to the order of the Northwold Steam Fishing Co., Limited, by Messrs. Cochrane & Cooper, of Beverley. The machinery was built and fitted by Messrs. Amos & Smith, of Hull. The *Larchwold* left Hull on Monday, June 8th, for Grimsby, where her fishing gear was put on board, and on Wednesday, June 10th, she took out a large party of the Northwold Co.'s directors and friends for a run in the North Sea. A capital trip was made, during which a trial was given to the new trawling gear, which includes Amos & Smith's patent trawl warp fairleader. Both the trawl gear and machinery worked to the best advantage. Mr. T. Sowerby, managing director; Mr. R. Long, director; Mr. J. W. Broughton, superintending engineer; Mr. R. Croft, marine superintendent, represented the owners; Mr. Cochrane, the builders, and Mr. Brackenbury, the engineers

Kia Ora.—On June 8th the twin-screw steamer *Kia Ora*, built by Messrs. Robert Duncan & Co., and engined by Messrs. Muir & Houston, Glasgow, for Mr. William A. M'Gregor, of Auckland, New Zealand, went on her official trial trip with representatives of builders, engineers, and owners on board. On four runs between the Cloch and Cumbrae Lights a speed of 10¾ knots was attained, which was about a knot in excess of the guaranteed speed. On the measured mile the steamer attained over 11 knots. On returning to Port-Glasgow in the evening she was put on Messrs. Blackwood & Gordon's slip for the purpose of getting her propellers and tail-shafts withdrawn, funnel removed, and an extra mast fitted in, preparatory to sailing out to New Zealand. The *Kia Ora* will afterwards proceed to Glasgow to load.

Truma.—On June 9th the *Truma* (s.), built by Messrs. Short Brothers, Sunderland, was taken out on her trial trip with a result gratifying to both builders and owners. The vessel is of the following dimensions:—Length, 255 ft.; breadth 36 ft. 9 in.; depth, moulded, 20 ft. 4 in., with a carrying capacity of about 2,550 tons. She has been built to the order of the Truma Steamship Co., Arendal, of which Mr. C. T. Boe is manager, and is classed 100 A1 at Lloyd's and 1 A1 Det Norske Veritas. After compasses had been adjusted the vessel was run over the measured mile, and a speed of 11½ knots was attained, the engines working smoothly with no apparent vibration.

Ashby.—On Wednesday, June 10th, the s.s. *Ashby*, just completed by Messrs. Ropner & Son, Stockton-on-Tees, to the order of Messrs. Ropner & Co., West Hartlepool, left the river Tees for her official trial trip. On the arrival of the vessel in the Tees Bay her compasses were duly adjusted, after which a very satisfactory run was made, the machinery working very effectively and easily. After the trip the steamer proceeded on her voyage to Bilboa.

Eronto.—On June 10th the trial trip of the steamship *Eronto*, built by the Elsinore Iron Shipbuilding and Engineering Co., Elsinore, Denmark, to the order of Messrs. Hans Kiœr & Co., Drammen, Norway, took place in the Sound, and was considered very satisfactory. The vessel is built of steel to the highest class at Norwegian Veritas, and her dimensions are 238 ft. 9 in. by 34 ft. 3 in. by 13 ft. 3 in. depth of hold. The engines are of the triple-expansion type with surface condenser. During the trial trip the engines indicated 950 H.P., and the normal speed was 10 knots with a consumption of coal, it is stated, of only 0·6 kilogrammes per I.H.P.

Boxgrove.—On June 13th this large steel screw steamer recently launched from the shipbuilding yard of Messrs. John Priestman & Co., Southwick, left the Wear for her trial trip. The *Boxgrove* is owned by Messrs. Sidney Ferneaux & Co., London, and is a sister ship to the *Roseville*, built this year by the same builders. Her dimensions are:—Length, 336 ft.; breadth, 47 ft.; and moulded depth, 24 ft. 10 in. She has a full poop aft, long bridge-house, and topgallant forecastle, and is divided into watertight compartments by five steel bulkheads; also an iron centre bulkhead fore-and-aft of the vessel, and iron cargo battens. A double bottom for water ballast is fitted in each hold, the after peak being used for the same purpose. The saloon, together with accommodation for captain, is tastefully fitted up in a large deck-house on the bridge, officers' and engineers' berths being arranged in houses at the sides of the engine casing, and the crew under the topgallant forecastle. The engines are of the triple-expansion type, and have been constructed by Messrs. William Allan & Co., Scotia Engine Works, Sunderland, with cylinders 24 in., 40 in. and 66 in., 45 in. stroke, with two large boilers of the single-ended type designed for a working pressure of 160 lbs. per square inch. When the vessel was run over the measured mile she attained an average speed of 12·1 knots per hour, which was considered most satisfactory. After the trial the vessel proceeded on her first voyage to Quebec, under the command of Captain Malby.

Ragnar.—On June 15th the fine screw steamer *Ragnar* left the Port of Hartlepool on her trial trip. The *Ragnar* has been built by Messrs Wm. Gray & Co., Limited, to the order of Mr. L. H. Carl, of Copenhagen, and to Lloyd's highest class. Her length over all is 285 ft.; breadth, 39 ft. 6 in.; depth, 19 ft. The deck erections consist of poop, raised quarter-deck, and partial awning deck. A handsome saloon, state-room, and accommodation for captain and officers have been fitted up in the poop, and comfortable quarters for the engineers amidships, and for the crew forward. The hull is built with web frames and cellular double bottom, and with large ballast tank in the after peak. Four steam winches, large patent donkey boiler, steam steering gear placed in the engine-room casing, hand-screw steering gear aft, direct steam windlass, schooner rig, boats on beams overhead, grain divisions, and all improved appliances for working the steamer have been provided. The engines are of the triple-expansion type, and have been supplied by the Central Marine Engine Works of Wm. Gray & Co., the cylinders being 21 in., 33 in., and 56 in. in diameter, with 36 in. piston stroke, and steam is supplied by two large steel boilers working at a pressure of 160 lbs. per square inch. When opened fully out the engines ran 83 revolutions per minute. For trials on the measured mile they were reduced to 75 revolutions, when the mean speed was found to be 10·3 knots per hour on a low coal consumption. The trial was a highly satisfactory one, the engines running without trouble or hitch of any kind, and the boilers remaining quite steam-tight. The trial was witnessed by C. Nielsen, Esq., J.P., Danish Consul; Mr. Hans Nielsen, Mr. Chas. Nielsen, Mr. Albert Trechmann, Captain Murrell (representing the builders of the ship), Mr. Mudd (on behalf of the engine builders), and Mrs. Mudd, of West Hartlepool; and Mr. Knutzen and Captain Nordahl, of Sunderland. The vessel and her machinery have been constructed under the personal supervision of Captain Jorgensen, who has also gone to sea in command of the ship. On the conclusion of the trial the vessel discharged her passengers to tug in Hartlepool Bay, and proceeded to Sunderland to take in her first cargo. The *Ragnar* is the second vessel built and engined for Mr. Carl by Messrs. Wm. Gray & Co., being a sister ship to the *Sigurd*, recently sent to sea.

John Herron.—On Tuesday, June 16th, the new paddle-steamer *John Herron*, which has been built by Messrs. John Scott & Co., under the superintendence of Messrs. Flannery & Tritton, of Liverpool and London, for the Wallasey Urban District Council, proceeded on her trial trip on the Firth of Forth, previous to being despatched to the Mersey. The results were very satisfactory, the vessel being well within her specified draught, and attaining a maximum speed of upwards of 13 knots per hour, the machinery working without the slightest trouble. The vessel was also put to a severe test as to her steering capabilities, and proved to be exceptionally handy. The Wallasey Urban District Council were represented by their chairman, Captain John Herron (after whom the vessel has been named), and several members of the committee, who travelled up specially from Liverpool to be present at the trial, and who expressed their approval of the vessel. The smart appearance of the vessel, with the funnel amidships, and the long airy saloons, which were tastefully decorated in carved wood and gold, were specially admired; and it is fully anticipated that this vessel and her sister boat now in progress will become the favourite vessels of this class on the Mersey.

Prudente de Moraes.—On Thursday, June 18th, the Brazilian passenger steel twin-screw steamer *Prudente de Moraes*, which has been built to the order of William Brice, Esq., by Messrs. Craig, Taylor & Co., was taken to sea for her trial trip. The dimensions of the vessel are: 230 ft. by 33 ft. by 20 ft. depth, moulded. The engines, which worked throughout with perfect smoothness, have been constructed by the North-Eastern Marine Engineering Co., Limited, Sunderland, and easily maintained an average speed of 11½ knots per hour loaded, everything being highly satisfactory.

Oilfield.—On Friday, June 19th, the s.s. *Oilfield* was taken to sea for her trial trip. This vessel is one of the most modern type of oil tank steamers designed and constructed for carrying oil in bulk, and represents the latest outcome in experience in this special trade. During a series of runs over the measured mile with several of the oil compartments filled she attained a speed of nearly 12 knots per hour. She has been built by the Tyne Iron Shipbuilding Co., Limited, Willington Quay-on-Tyne, for Messrs. Hunting & Son, of Newcastle-on-Tyne, and is the third steamer which this firm has built for this special trade. She is divided into small compartments and is designed to meet the requirements for steamers carrying petroleum in bulk through the Suez Canal. She has a most efficient double system of pumping machinery so as to provide against possible contingencies, has the electric light fitted throughout and special arrangements for ventilating and cleaning her oil compartments. The previous steamers have been doing their work in a remarkable successful manner which give promise that this one will be equally successful. She is over 355 ft. in length, 47 ft. in breadth, and carries nearly 6,000 tons on a very light draught. Her engines are 27 in., 44 in., 71 in. by 48 in., with three single-ended boilers, and have been constructed by the Wallsend Slipway and Engineering Co., Limited, of Newcastle-on-Tyne. At the trial were present the owners and many of their friends, together with Mr. Taylor, inspecting engineer, and Captain Brunton, under whose superintendence and inspection the vessel has been built.

Claverhill.—On Saturday, June 20th, the fine new steel steamer, built by C. S. Swan & Hunter, Limited, of Wallsend-on-Tyne, for Messrs. Edmund Haslehust & Co., of Billiter House, London, was taken to sea for her trial trip. The *Claverhill* is a spar-deck steamer, 310 ft. b.p. by 42 ft. by 27½ ft. deep, and is designed to carry a deadweight cargo of 4,600 tons, as well as a very large measurement cargo. She has a cellular double bottom throughout and a trimming tank aft, with a complete equipment of the latest appliances for handling cargo. The accommodation for the captain, officers, &c., is in a steel house on the bridge deck, so that the whole of the bridge space is left clear for cargo or bunker space. The machinery has been constructed by the North-Eastern Marine Engineering Co., and consists of a set of their latest design of engines, with cylinders 23 in., 38 in., and 61 in. diameter, by 39 in. stroke; two steel boilers 14 ft. 9 in. by 10 ft. long. During the construction the vessel has been superintended by Messrs. Jacobs & Barringer, of London, as well as by Captain Wigley. During the trial trip the machinery worked most satisfactorily, and after the trip the steamer proceeded direct to St. Petersburg, where she will load general cargo for Vladivostock.

Latona.—On June 24th the steam yacht *Latona*, 265 tons Y.M., built by Day, Summers & Co., Southampton, for Baron Andrew W. von Knoop, of Rutland Gate, London, ran her speed trials in Stokes Bay, when a speed of over 12 knots was obtained.

Britannia.—On June 24th the handsome saloon paddle-steamer *Britannia*, recently built by Messrs. S. M'Knight & Co., Limited, Ayr, for Messrs. P. & A. Campbell, went on her trial trip. The *Britannia*, which is the fourth steamer built by Messrs. M'Knight for the same owners, is intended for passenger service in the Bristol Channel, and is splendidly fitted out, alike as regards comfort and elegance. The vessel is a "flyer," and if she had been intended for the Clyde would have ranked as one of its fastest boats. The run was from Ayr to Kilmun, thence to Kilcreggan, Gourock, Skelmorlie, Lamlash, where a call was made; back to Gourock, and then to Greenock. A uniform speed of about 19 knots per hour was maintained, with some slight variations above and below that rate. This, when it is considered that the speed estimated for was 18 knots, may well be considered satisfactory. There was a large company on board, including Messrs. Peter and Alex. Campbell, representing the owners; Mr. Peter Taylor, managing director; Mr. Watson and Dr. Haddo, representing the builders; Mr. Hutson, sen., Mr. Hutson, jun., and Mr. Pattie representing Messrs. Hutson & Son, the engineers; Provost Willock, Bailie Templeton, Treasurer Meikle, and others, from Ayr: Mr. M'Dowall, Glasgow; Mr. Darling, Captain M'Kinnon, Mr. Seath, Langbank; and Mr. Miller, of the Grangemouth Dockyard Co. Luncheon was served in the dining saloon during the run down, Mr. Peter Taylor presiding. The trip occupied all the afternoon, and was thoroughly enjoyable, besides being a real test of the vessel's capabilities. The *Britannia* left for Bristol, where she is due to fulfil several engagements.

New Dredger.—The East London Harbour Board, South Africa, have ordered a powerful twin-screw sand pump hopper dredger, of 1,000 tons capacity, from Messrs. Wm. Simons & Co., Limited, Renfrew. The vessel will be fitted with special arrangements for dredging the bar at East London.

Reviews.

The Sheet Metal Workers' Instructor. By R. H. Warn and J. G. Horner. London: Crosby Lockwood & Co. 1896.

The present volume, though nominally a second edition of an older work, is practically a new one. The "Instructor" was originally written by Mr. Warn, as we are told in the preface, and it is now enlarged, revised, and altered by Mr. Horner. The first edition, being by a practical man, was apt to assume too much knowledge on the part of the reader—for what a writer is himself familiar with, he is apt to assume that others know equally well. Mr. Horner, being an engineer, has taken the book in hand, as it were, from an outside point of view, and assumed less technical knowledge in the beginner, whilst at the same time he has gone into the mathematical problems which underlie the art of sheet cutting, and in fact reduced empiricism to a scientific basis. Anyone who contemplates the work of manufacturing articles of daily use from sheet metal will at once see that a knowledge of geometry and of mensuration is invaluable to those engaged in the art. And accordingly there are chapters on these subjects in so far as they are needed for the purpose. By far the largest part of the work is occupied by the discussion of practical problems. Under this head the readers are briefly and clearly shown how to draw various mathematical figures which will be needed in active work, and are also told how to make the necessary patterns for a large number of articles which are in daily demand. All these are illustrated and explained by the aid of diagrams with full references in the text.

Having been shown how to make a pattern, we are naturally next brought to the question of a metal in which the work itself should be executed. And here the various properties of metals and alloys are discussed with regard to their suitability for the different classes of work for which the articles to be manufactured are design-d. The ninth chapter deals with the methods "of raising courses," and beating the plates and sheets into the desired shape. This is a matter in which, of course, experience and shop-teaching alone can give perfection, but as far as diagrams and verbal explanations can help, this very special part of the instruction of the beginner is made clear. So too, in the next chapter, is the work of jointing, so important for success in making lasting articles. The special tools and machines of the trade are then described, and the book is completed with some useful tables of dimensions, standard wire gauges, and weight of superficial areas of sheets of metals. We We have said enough to show that the book is a valuable and interesting one, and is likely to remain the standard text-book of this art for many years to come.

Naval Administration. By Sir R. Vesey Hamilton, G.C.B. London: George Bell & Co. 1896.

This volume is the first of the series of Royal Naval handbooks No better person could have been secured to write it than one who has had five years as sea-lord at the Admiralty, and has as great a reputation as a seaman and as a man of the world as has Sir Vesey Hamilton. Yet we cannot promise our readers the same treat in reading the volume as they will experience in the perusal of Mr. Oldknow's and Lieut. Armstrong's works. Of course, it would be impossible to excite the same universal interest, either in the general reader or in the engineering student, over the dry details of official work as in the mechanical results of the torpedoist and the marine engineer. Yet we think it would have been possible to have treated Whitehall and its history in a less dreary manner. The greatest of our British diarists was himself an official of the Admiralty and was concerned in the making of the routine which Sir Vesey describes, yet it would have been impossible for Samuel Pepys to have been dreary or wearisome on any conceivable subject. The subject of the organisation at the Admiralty is one of the first importance as regards the vital question of national defence. We cannot expect to succeed in a naval war with a first-class maritime power unless we are ready with material, with personnel, and organisation to make instant use of the means which have been provided. The work of Sir Vesey Hamilton goes to show how, through all the changes in form and arrangement, the Admiralty has preserved its characteristic of flexibility. That is to say, that though there is, of course, departmental red tape, there is still great power in the department to adapt itself to circumstances and to cope rapidly with an emergency. Now the book deals really with, and may, in some sort, be presumed to be an official answer to the attacks which Mr. Spencer Wilkinson has made upon the Admiralty. With all the enthusiasm of a reformer Mr. Spencer Wilkinson has urged that official responsibility for the efficiency of the whole of our naval preparations should be fixed upon some sea lord, who should be put into the position of guarantee to the country that the estimates annually demanded for the Navy are sufficient to place us in a satisfactory position for defence, in case of any complications, and that he should be held responsible to the country, if, when the test of war came, things were not found to be as they should be. In short, Mr. Wilkinson has urged that we should have a naval Moltke at the Admiralty. Though not directly replying to this student and writer, Sir Vesey shows how at the Admiralty work and responsibility are divided and portioned out amongst the various civil and sea lords. He gives summaries of the duties of the various officials of the Admiralty, and in an appendix gives numerous Orders in Council defining the duties of various departments and officials, It will be seen that he deals with a very grave subject. Failure in the organisation would be fatal in time of war. Ships and men are no use if not properly supported at home. For these reasons, therefore, the subject is one of vast importance. It is well that all attention should be directed to the subject, and though, as we have said, we cannot promise readers a light repast, they will find it substantial and most instructive. The volume has some interesting portraits of great men at the Admiralty as well as some representative of the Admiralty buildings as they were in the old times.

Metallic Structures: Corrosion and Fouling, and their Prevention. By John Newman. London: E. & F. N. Spon. 1896.

Though going very fully into the subject-matter with which it deals, the present volume is not intended to be exhaustive, but rather to form as it were a *vade mecum* from which can be drawn concise practical information on a subject of much importance to all having to do with the design, construction, and maintenance of floating or fixed metallic structures, and more especially to direct attention to some salient points regarding the prevention or arrest of corrosion and fouling.

The author, after many years' experience of the subject, has not only recorded his own extensive observations, but has supplemented these with the varied experiences gained by others in all parts of the world.

To aid in his aim to present as concisely as possible information which may be of service to engineers, owners, and those having the care of iron or steel structures and ships, the author has not repeated the well-known analysis of iron, steel, air, water, &c., which are to be found in the various exhaustive works relating to them, but has fully indicated some preventive and remedial measures that can be adopted for the preservation of the structures mentioned from corrosion and fouling.

The author briefly examines the causes of fouling and corrosion in sea water, and also discusses the qualities required in an anti-corrosive and anti-fouling paint, and also deals with other coatings used, with the object of preventing the deterioration in the manner indicated, of ships or any submerged or partly submerged work.

The book is divided into two parts, part I., consisting of sixteen chapters, being devoted to discussing "The safety and preservation of iron and steel structures," while the thirteen chapters of part II. deal with "The prevention of fouling and corrosion in submerged structures and ships."

In addition to pointing out the advantages and disadvantages of certain paints, compositions, &c., the author reveals some very clever "scamping" tricks indulged in when painting, and also calls attention to the fact that some paints are decidedly explosive in character, as evidenced by a number of cases he cites, four such explosions having occurred on board Her Majesty's ships.

Though of course primarily intended for those technically engaged in the matters it deals with, and to whom it cannot but prove of inestimable advantage, the book may well be read and to his interest and profit, by any layman possessed of metallic structures susceptible or exposed to the influence of corrosion or fouling.

Latitude and Longitude: How to find them. By W. T. Miller. London: Charles Griffen & Co., Limited. 1896.

As is indicated by the title, this little book, one of the same publisher's admirable "Nautical Series," is designed to present to the reader, in a simple and lucid manner, a selection of typical problems relating to the finding of position at sea by means of the sun's, or stars', altitude.

The book does not profess or attempt to go beyond the rudimentary stages, the student of navigation being left to refer to more elaborate treatises for a mastery of the subject; but he must indeed be a very dull reader who does not with the assistance of the diagrams and examples given obtain a definite conception of the principles underlying the well-known methods as now adopted for determining latitude and longitude.

What may be termed the explanatory part of the book is carefully and, though concisely, yet clearly written, and its possession cannot but prove an acquisition to those studying navigation, to whose perusal we can with every confidence recommend it.

Engineer Draughtsmen's Work. By a Practical Draughtsman. London: Whittaker & Co. 1896.

In preparing this carefully written and clearly illustrated book of 96 8vo. pages the author has endeavoured rather to initiate the tyro into the *raison d'être* for, and correct manipulation of, the different instruments used by the draughtsman, than to impart any information to the practised hand, though even the latter could not but fail to profit by a perusal of the chapters dealing with the "Use and Care of Instruments," "Tracings and Blue or Black-and-White Prints," and the "Record and Storage of Drawings."

A chapter dealing with "Preparation for Draughtsmen engaged in various Branches of Work," should be read by all intending to take up this branch of the profession, as it briefly indicates the class of work and study a man should take up as preparation for aiding him in the correct delineation of the different objects he will afterwards meet with in the pursuit of his vocation.

The book is well illustrated by some 80 diagrams, and cannot but prove useful to the novice.

The Naval Annual, 1896. Edited by T. Brassey. Portsmouth: Griffin & Co. 1896.

After editing nine issues of the Annual and getting the book known and appreciated, not only in our own country, but amongst all the maritime nations of the world, Lord Brassey has found it impossible to continue the work he has begun and so long carried on with credit to himself and benefit to his readers, and we find his name no longer on the title page. The son, who has recently worked in collaboration with him, now has the sole responsibility, but we shall not find the volume less instructive or of less importence than those which preceded it. The initial chapter is by the editor, and in it he describes the two most important classes at present building for the Navy. Whilst the account of the *Majestic* and her class is interspersed with thoughtful criticism, there is, unfortunately, no discussion of the points of the *Powerful*. Perhaps these are kept back for the next issue, for neither of the two vessels which are comprised in this class have yet undergone their trials, whilst we all know something of the behaviour of the new first-class battleships. Descriptions of the other types now in favour are also given, and a remark is made that "the question of the dearth of officers has now been thoroughly grappled with." The reference here to the seaman question is made in these words:—"The numbers of men at present available are quite inadequate to meet the requirements of war. A large addition to the Naval Reserve is imperatively necessary." There is probably no question that more affects the existence of the British Empire than this which touches the manning of the Navy. It is full of difficulty. We can, owing to our position as a shipbuilding nation, turn out vessels with an unequalled rapidity. We have now reached a stage when we can turn out a ship much more rapidly than we can train a man when we have got him. In the days of the old wars we could press anyone, and in a short time make something of him. Now all that is changed. The delicate and complicated mechanism of modern warships requires a long training for men as well as for officers, and the London cabmen of whom we read as being sent out to the Baltic at the time of the Russian war, would be absolutely useless nowadays until long after any conceivable war had concluded. We have not enough men in the Royal Navy to man the ships we have. We have not enough ships. We must build more, and so we must settle this manning difficulty at once. The First Lord says there is no difficulty in getting as many men for the Navy as we want. That, say some, is because the British sailor is being driven out of the British merchant ship, and is being replaced by the foreigner. If that be true Mr. Goschen cannot hope to continue finding plenty of men for the Navy from that source, for it will soon be dry. He is living on his capital. Yet we cannot keep a peace establishment which will be big enough to man all the ships that would be in commission in time of war, to say nothing of the numbers that would be needed to replace those lost or disabled in action. So large an establishment would be extravagant and very burdensome to the taxpayer.

We are, therefore, clearly brought to the necessity of having a much larger Naval Reserve. That may be taken for granted. But there is still plenty of room left for discussion as to the best method of securing the men and of training them, and of rendering it probable that we shall get their services where we want them, immediately war breaks out, and that without crippling our merchant ships. For the latter would be needed quite as much in war time as in time of peace to bring in food supplies and maintain our trade. After discussing various methods of maintaining the Reserve the country needs, the conclusion is arrived at that a system of State-aided apprenticeship is the right method. This, of course, would be a system that would require time to develop, and time is of the utmost importance now, when the air has been so charged with electricity and war clouds have sprung up in every direction. Still we must always look to the future, and the editor suggests that we might get valuable recruits by tapping the fishing population. He points out what a large, untapped reservoir of suitable men there is in the colonial fisheries.

We most note how excellent are the illustrations in the present volume. The pictures of the new first-class cruisers will appeal to all, whilst those who are interested in the battle between armour and guns will turn to the illustrations of the armour-piercing trials, made with Krupp and Carnegie plates. The diagrams of men-of-war have been brought up to present appearance of altered ships, many vessels having shown themselves at the Kiel review to have altered their appearance since the original plates were taken.

The usual tables of ships and guns are given, as well as the recently-added tables of torpedo boats. These latter tables have been revised.

From our discussion of the manning question we were led from the first chapter of the book to one much later on. We must therefore retrace our steps. The account of what is doing in foreign navies show how important it is that we should keep ourselves armed at all points. There is a description of the two large battleships now building at Newport News for the United States Navy. These were authorised to be built last year, and, though only 11,500 tons in displacement, will cost nearly a million sterling each. The peculiarity of these vessels—if we omit to discuss the feature common to them, and to all other recent vessels of the American Navy: we mean the characteristic of professing to do all a British ship of a similar type can do, though the Britisher be half as large again—the peculiarity, we say, of these vessels is the two-storied turret containing two pairs of heavy guns. The criticism is made that here is accentuated the fault of the usual system of mounting guns in pairs. It is said that if guns are put in pairs, there is the risk that a lucky shot may put both out of action simultaneously. Here it may be said that it would be possible, or at least conceivable, that all four were disabled at once. Besides, even if great attention is being paid by the designers to the steadiness of these ships, the tendency of the double turret must be either towards top-heaviness or else towards the placing of the lower deck guns at too slight a distance above the water line.

A good deal is said as to the new construction by our neighbours at the other side of the Channel. Here we notice the *Foudre*, spoken of as a torpedo depot ship. She was certainly designed as such, but we have recently heard that the intention regarding her was altered, and that she was to be completed as an ordinary cruiser.

A new feature has been introduced into the Annual in the careful discussions of the French and Italian systems of organization and administration of the Navy. These two important admiralties are written of by local experts, if we may use the term "local" of men whose reputation is as world-wide as that of M. Weyl, who discusses the navy of his own land. Though we cannot learn, perhaps, much about shipbuilding or ship management—using the term in its widest sense—from foreigners, we may probably learn a great deal about administration. Great attention is paid to the manœuvres and their lessons, in the present volume, which the coming importance of Japan and the practical lessons she and China have given to the world are fully recognized.

On the whole, we must say that the Annual keeps up its value as a guide to the state of the war fleets of the world as they are, and will be, in the immediate future. It is singularly accurate, and it is compiled by men who are all distinguished in the various branches of naval knowledge. At the present time, when all nations are overhauling their ships, and seeing that they are properly equipped and sufficiently numerous for possible and immediate war, the volume is more necessary than ever. We may be sure that, as the intelligent interest in the Navy spreads and grows, there will be found a wider body of readers to appreciate and ponder on the facts here so patiently collected and carefully arranged for their information and guidance.

Torpedoes and Torpedo Vessels. By Lieutenant G. E. Armstrong, late R.N. London: George Bell & Co., 1896.

THIS volume is one of the new series of handbooks concerning the Royal Navy which are now being published by Messrs. Bell, under the editorship of Commander Robinson. The present book deals with a subject with which the general public not unnaturally associates great possibilities. Until recently everything connected with the torpedo has most justifiably been kept as secret as anything can be kept—save from perhaps the foreign attachès, as the writer of the present volume aptly remarks in one place. The absurdity of telling all our secrets to these representatives of our possible adversaries can only have one justification. It is the fact that now-a-days the war-game is a game of bluff. That in these days of bloated armaments and the terrible expense, both in blood and treasure, which war between civilized powers means, the simplest way to avoid trouble is to show the accredited agents of foreign Powers that we are at all times ready and able to take care of ourselves.

The imperfect and hastily-made torpedoes which were used in the Russian war forty years, ago and subsequently in the American war, showed how important a factor the torpedo must be, whilst more recent experience with perfected weapons in the far East and in South America have not lessened its reputation as a destructive weapon; but have rather shown that its moral effect must not be lost sight of.

Lieutenant Armstrong is very fortunate in having such a subject to deal with, and he uses his opportunity well. He traces the development of Mr. Whitehead's invention and shows us how, as each difficulty arose, the mechanical ingenuity of the inventor was able to find a solution. The methods in which the premature explosion of the torpedo are guarded against may be instanced, and so may be the arrangements whereby the running away of the little engine in the interval before the screws are in the water is obviated. Another point in which the torpedoists have given evidence of their skill is in the invention of the scissors for the destruction of torpedo nettings. And in this connection the author points out how the value of manœuvres is destroyed and their results rendered misleading by the fact that, in spite of the existence of these means for cutting them, the rule is maintained that the nets count as a defence against torpedo-boat attack.

The kindred subject of mines and counter-mines are dealt with, and of course the methods of discharging torpedoes is gone into. This brings the writer to the discussion of ships. Here he describes not only the torpedo-boat, and the more recently invented "destroyer," but also the *Vulcan*, the floating factory for the repair of boats and torpedoes. The *Vulcan* is dealt with at considerable length. But she deserves it all. For Lieutenant Armstrong rightly attaches great value to her. He laments that we have no others in our Navy. The volume will be interesting to all who are interested in naval questions, and it indirectly shows how necessary it is to have a fully trained body of men ready for any emergency. A man may be an excellent sailor and yet be absolutely useless for the work of the Navy to-day. The knowledge and the skill and coolness required to keep all the complicated gear in order and to work up to the proper discharge of a torpedo under fire, the hundred little details which must be seen to (and seen to in their proper order) if the costly missile is to have its deadly effect on an opponent, cannot be acquired save by long study and much drill. The slightest error may not only ruin the attempt but even turn the weapon to the destruction of the wielder. We must not forget to add that the volume is fully illustrated with pictures and diagrams and is calculated to give the general reader a very fair knowledge of this hitherto mysterious weapon.

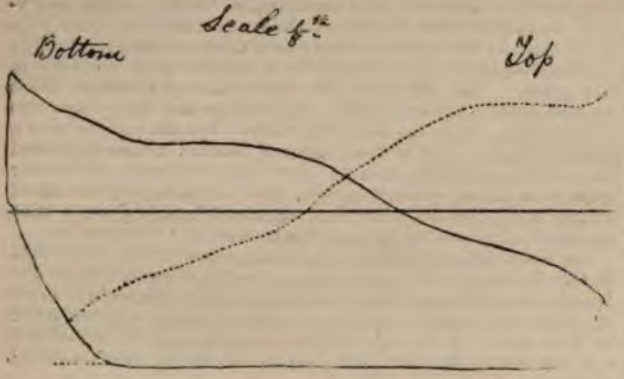
Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—Ed. M. E.]

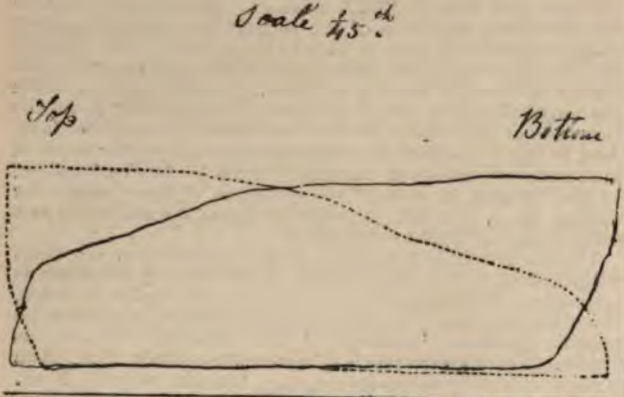
INTERNAL FRICTION IN STEAM ENGINES.

To the Editor of The Marine Engineer.

Sir,—In your November and December numbers I read with great interest the ably written article by Mr. W. W. Houfe, of Hong Kong, on the internal friction in steam engines, together with the discussion thereon. I cannot agree with Mr. Houfe in his condemnation of Ramsbottom rings, having used them for many years in this and other steamers. Four-and-a-half years ago, I had the high pressure piston of this vessel altered, from a floating ring to three cast-iron Ramsbottom rings, and a year later the low pressure piston likewise; with such beneficial results, that neither piston has cost any money for repairs, as the original rings in both are still good and show actually no signs of wear. The high pressure rings have been paened twice, and the inside of both cylinders look bright and smooth. You can guess the amount of work they have done, when I say the ship has run a distance of over 52,000 knots per year since the first alteration, at a speed of slightly under ten knots per hour.



Steam 92 lbs, Vac. 20 in., rec. press. 8½ lbs., revol. 86. Exp. 16½ in. by old marks, and ¾ in. liner under pin.



Steam 88 lbs.; vac., 21 in.; rec. press., 7½ lbs.; revol., 86. Exp., 16½ in. by old marks, and ¾ in., liner under pin.

Coal very bad. Light breeze ahead, sea moderate. No sail set between Auckland and Raratonga.

Re internal lubrication, I think Mr. Houfe correct in his theory of the watery particles in the steam, preventing the abrasion of the surfaces, as the small amount of oil used in modern engines (owing to considerations of the boilers, especially where no feed-water filters are used), is, in my opinion, inadequate for the large surfaces requiring lubrication. If the great steam pressure could be taken off the slide valve faces, in an efficient and economical manner; a very great saving in friction, and consequent gain in power, would be effected, as in most engines that is a serious loss with the old D valves. I also think a filter in the exhaust passage to condenser, as Mr. Houfe speaks of, a step in the right direction, though it might require different media to that in use at present. Another matter of grave importance to steamers on long ocean voyages, is the conservation of fresh water, especially in ships not fitted with evaporators.

Given tight boilers, I see no reason why with suitable appliances, nearly every drop of fresh water should not be saved and returned to boilers, so saving time and expense, scaling and cleaning boilers in port, a bugbear to both owners and engineers.

I would like to see your correspondence columns more fully availed of by marine engineers, many of whom could give their brethren valuable experiences of breakdowns, repairs at sea, &c., and so lead to interchange of thoughts amongst the cloth, besides being of infinite use in times of accident. I have found your magazine at all times most interesting, and consider no steamship engineer should be without it; both chiefs and juniors must derive much useful information anent the latest inventions and ever-changing matters, in connection with their profession.

I enclose a set of indicator cards.

I am, Sir,
Yours, &c.,
John D. Stuart, Engineer,
s.s. *Richmond.*

Auckland, New Zealand.
May 11th, 1896.

Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships, from May 7th, to June 10th, 1896.

9466 G. Hopkins and R. W. Archer. Water telescope.
9485 C. Ankers. Lubricators.
9494 J. C. Jackson and J. Ogden. Steam valves.
9500 G. F. Forster. Spanners and wrenches.
9560 A. H. Wethey. Furnaces.
9571 C. F. G. L. P. de Chasseloup-Laubat. Steam engines.
9587 S. J. Hamblin. Water-tube boiler.
9589 F. Bosshardt (J. R. Frikart, Germany). Shaft governors.
9652 L. H. Jung and H. A. Clifton. Valves, &c.
9653 F. Edwards. Pumps, valve guards, &c.
9692 T. F. Drew. Ramming vessels.
9712 J. A. McKie and P. M. Baxter. Stays for boilers.
9715 J. Y. Johnson (Redway Manufacturing Co., United States). Valves.
9729 J. Griffin. Raising and lowering boats.
9751 A. C. C. Azemar. Boat propelling apparatus.
9762 A. S. F. Robinson. Engine governors.
9844 J. Brunn. Feed-water purifying apparatus.
9882 J. A. Crawford and T. A. Crawford. Closing water-tight doors.
9902 A. E. G. Birkbeck. Crank driving gear.
9927 A. C. Sheppard. Uniting broken shafts.

9940 C. Wood and A. C. Caddick. Four-way valves for furnaces.
9948 W. Burns. Feeding water into steam boilers.
9957 W. P. Thompson (T. Lister, South Africa). Metallic packings.
9958 J. Davies. Multiplying power of steam, &c.
9980 J. A. Magill. Self-adjusting packing ring.
9982 H. Lane. Internal combustion engines.
9997 G. Fletcher (E. Y. Connell, West Indies). Traps for condensed steam.
9998 E. B. Badcock, jun. Producing motive power.
10018 H. Lane. Constructing motive power apparatus.
10019 R. T. Preston and J. Holden. Stays for steam boilers.
10034 N. Dakin. Valve.
10044 C. Devine. Steam engines.
10098 J. E. L. Ogden. Gauge glasses for steam boilers.
10117 L. Pitsch. Cowls for ventilating shafts, &c.
10200 J. T. Towlson. Arc piston stroke, &c.
10223 R. Archer. Metallic packing for piston rods.
10230 E. Bauer. Machine for cutting plate-iron.
10247 C. M. Douglas. Folding boats.
10248 E. J. Clubbe and A. W. Southey. Internal combustion engines
10264 M. H. C. and R. E. C. Shann. Bending of ship frames.
10265 M. H. C. and R. E. C. Shann. Ship frames.
10266 S. O. Cowper-Coles. Internal combustion engines.
10286 G. W. Hart. Rotary engines.
10294 D. Rushworth. Heating feed-water.
10312 R. B. Smith. Automatic feed-water regulators.
10313 J. Butterworth and R. F. C. Tonge. Metallic packings.
10384 F. R. Simms. Cooling the cylinders of engines.
10385 F. R. Simms. Cooling the explosion cylinders of engines.
10386 F. R. Simms. Combined steering handles, &c.
10389 W. B. Crichton. Steam engines.
10405 A. R. Fordyce. Metallic lathing.
10409 J. Lumb. Lubricating heavy bearings.
10413 R. E. Bradford. Compound fluid pressure engines.
10424 F. R. Simms. Cooling surfaces of cylinders.
10436 J. Cuthill. Metallic packing for engines.
10446 J. M. Ramsay. Ships' rudders.
10479 B. J. B. Mills (H. Rostagnat, France). Stuffing-box.
10486 G. Henderson and T. Hindson. Piston rings.
10505 W. A. Bennett. Metallic packings.
10512 E. F. Sargeant. Leather belting apparatus.
10524 F. H. and F. H. Pellew. Manœuvring of ships.
10553 W. Furness and W. J. Bell. Furnace grate-bars.
10587 R. J. Eke. Steam, oil and gas engines.
10602 A. Herbert. Capstan or turret lathes.
10609 F. Espir (W. C. Jack, Tonkin). Pipe coating material.
10622 R. L. Weighton and D. B. Morison. Engines.
10669 A. G. New. Electrical variable speed gear.
10687 J. Lohymeyer. Utilising the tidal flow.
10690 Tangyes Limited, and J. Robson, jun. Mechanism for stopping machinery.
10696 H. H. Lake (Todtenhaupt & Helms, Germany). Lubrication of bearings.
10709 L. S. d'Iszoro. Rotary pumps and engines.
10711 L. Lawrence. Mechanism for marine propulsion.
10717 A. Racic. Tubes.
10747 A. G. Browning. Hydraulic pumps.
10749 T. Banks. Stowing heavy plates in ships.
10763 F. Svoboda. Siemens' regenerative furnaces.
10774 J. P. Hall. Water-tube boiler.
10793 J. L. Kennedy. Means for joining metal plates.
10800 J. H. Raffety. Lifeboat.
10824 J. Mohs and the Berliner Kunstdruck und Verlagsanstalt vormals A. and C. Kaufmann. Sounding apparatus.
10828 H. H. Lake (E. P. Howe, United States). Rotary engines.
10829 J. Roots. Internal combustion engines.
10832 E. H. Smith and W. O. V. Schaick. Wrenches.
10860 R. T. Preston and J. Holden. Stays for boilers.
10892 J. B. S. Booth. Actuating valves, &c.
10904 R. W. Barker (Midford Pneumatic Salvage Co., United States). Raising vessels.
10925 T. B. Rawlins. Anti-corrosive compositions.
10938 A. Pengelly. Sail arrangements for yachts.
10952 A. B. Brown. Steam winches for derricks.
10953 C. E. Mumford and J. W. Jaggard. Cellular cylinders.
10964 J. W. Gillie. Course finder for chart use.
10976 J. H. Maclure. Trawling apparatus.
10977 F. W. Ouston and M. Anderson. Steering vessels.
10984 J. W. T. Cadett. Engines.
11048 H. V. Holden. Casting armour plates, &c.
11051 T. F. Edwards. Valves.
11056 E. J. Clubbe, A. W. Southey, and the Electric Motive Power Co. Lubricating bearings.
11062 Tangyes Limited and E. Johnson. Valve for pumps.
11077 A. Peugeot. Friction clutch.
11078 A. Peugeot. Oil engines.
11086 C. A. Parsons. Propelling vessels by steam turbines.
11087 A. E. Paskell. Adjusting the hinged parts of plates.
11094 A. E. Narlian. Combination with floating bodies.
11108 I. H. Stringer. Securing boats' tillers.
11110 J. C. R. Okes and A. Stubbs. Steam traps.
11127 J. Evans. Producing steel tubing.
11147 R. H. Francis. Clasps for mooring purposes.
11208 L. Worthington and J. Soar. Shaft bearings.
11209 O. Bomborn. Vaporisers for petroleum engines.
11213 W. F. Suddaby and The Leeds Forge Co., Limited. Rolling furnace flues.
11226 A. Peugeot. Operating variable speed gear.
11227 C. Wehner. Stop valves for gas and steam.
11239 J. Maxton and A. L. Jones. Governing engines.
11248 F. A. Jones and J. Constabie. Pipe flanges.
11260 R. F. Hall, F. Warwick, and T. Smith. Machinery for manufacturing seamless steel tubes.
11277 J. K. Broadbent. Forced draught apparatus.
11279 S. Pointon. Heating boilers and furnaces.
11284 J. H. Knight. Instantaneous steam generators.
11291 A. G. Ramage. Boat propelling apparatus.
11292 J. H. Carruthers and H. Brier. Valves.
11293 Babcock & Wilcox, Limited, and W. Reavell. Feed-water heaters.
11294 T. Armstrong and J. Frankling. Adjustable wrench.
11301 E. N. Beszant and The Swiftsure Safety Kitchen Boiler Co. Coiled tubular boilers.
11351 W. Hayward. Rotary engines.
11366 J. Weir. Direct-acting steam pumps, &c.
11386 H. McIntyre. Sectional water-tube boilers.
11408 J. B. Davis. Lubricating stuffing-boxes.
11415 P. Reilly. Apparatus for cleaning ships.
11416 J. J. Kennedy. Lubricators.
11420 J. Lewthwaite. Motive power engines.
11422 J. and J. B. Swallow. Propelling boats, &c.
11434 A. B. von der Ropp. Automatically closing door.
11438 J. J. Campbell. Prismatic piston valve.
11442 A. Hoe. Steam engines.
11464 S. O. Cowper-Coles. Treatment of ores, &c.
11481 T. Tomlinson. Driving of machinery, boats, &c.
11486 R. E. C. Shann. Steam generators
11491 H. C. L. Holden. Internal combustion engines.
11496 J. R. Wigham. Occulting lights for lighthouses.
11498 S. M. W. Croskery (T. Roberts, United States). Piston packing.
11499 S. M. W. Croskery. Devices for sextants.
11560 C. Davy. Hydraulic forging presses.
11577 E. L. Kitchingham. Constructing marine vessels.
11656 F. Lamplough and F. T. Goodman. Engines and motors.
11658 C. A. Jensen (C. Stangeby, Norway). Keels of sailing vessels.
11703 D. C. F. Wulff. Stern tubes of steam ships.
11704 M. Le Blant. Constructing steam generators.
11717 W. T. Lougher. Covering steel plates with copper sheeting.
11733 A. J. Boult (J. B. Loquet and J. B. Ketelair, Belgium). Steam generators.
11736 J. Epton. Otter boards of trawling gear.
11742 J., E. T., T. W., and F. S. Tomey. Gauge glasses.
11759 A. Hardwick. Rubbers for carding engine condensers.
11775 J. Davies. Manufacture of weldless steel tubes.
11794 C. W. Siddle, R. Field, and W. G. Robinson. Obtaining high pressures.
11814 F. W. Zimer. Boats.
11833 R. A. Hadfield. Toughening manganese steel.
11846 W. Weir. Condensing water from steam.

11849 T. H. Poole and T. W. Wright. Steering gear.
11857 J. K. Oldfield. Fixing screw propellers.
11881 W. J. Pitt. Rotary engine.
11895 D. H. Sisson. Cleaning the bottoms of ships.
11900 E. Smethurst. Ship manœuvring apparatus.
11911 J. S. Raworth. Connecting rods.
11916 G. J. J. Manvell. Gauge glass protector.
11920 C. Neuhaus. Water gauges.
11924 A. J. Boult (P. Hamelle, France). Navigable vessels.
11932 E. J. Duff. Steam and vapour engines.
11933 J. R. Green. Steam generators.
11954 J. W. Melling. Governing speed of engines.
11956 K. Bryan. Hydraulic valves.
11971 R. C. McCunn. Guard for ships' tables.
11982 J. G. Lorrain (M. Pfatischer, E. S. Hosmer, and H. Binney, United States). Speed indicators.
11987 J. J. Cain. Tubular steam generators.
11990 J. P. Maginnis and R. Harrison. Frictional gear.
11996 C. D. Holmes. Boilers.
11999 R. J. Crowley. Marine telegraphy.
1204[illegible] G. Viggars. Steam generator.
12049 A. J. Hook. Boats.
12054 A. J. Boult (J. Comas, ——). Steam turbines.
12059 S. Lacavalerie. Steam generators.
12060 S. Lacavalerie. Rotary engines and injectors.
12101 T. R. Robertson and W. E. Moss. Reversing valves of engines.
12124 R. B. Molesworth. Gear for torpedoes, &c.
12125 A. Pillatt. Furnaces for water-tube boilers.
12164 W. J. Hay. Engines.
12165 W. J. Hay. Bearings for shafts, &c.
12209 G. P. Grace. Rotary engines.
12228 F. J. Reinisch and H. Lesser. Lubricant.
12236 H. Richardson. Engines.
12237 J. W. Spencer. Manufacture of armour plates.
12253 H. H. Lake (J. and A. Jensen and Dahl, Norway). Water chambers for water-tube boilers.
12256 M. H. C. and R. E. C. Shann. Bending ship frames.
12274 J. W. Hunter. Internal combustion motors.
12289 E. de V. du Boulay. Harbour, &c., lights.
12290 R. J. Urquhart. Internal combustion engines.
12310 W. H. FitzGerald. Boats, &c.
12322 H. Jordan. Stopping leaking boiler tubes.
12339 A. P. Kilpatrick. Rotary pumps.
12341 W. Brown. Hopper dredgers and barges.
12406 W. Hampton. Boiler settings and furnaces.
12413 R. J. Plunkett. Lifeboat with mechanical propulsion.
12414 P. R. J. Willis (The Cook Cooler Co., Limited, United States). Cooling journal bearings.
12446 J., S., F., and E. Carter. Explosion engines.
12457 O. G. Panse. Motive power engines.
12459 J. Gandon. Mechanical propelling power.
12465 J. Gordon. Protecting submerged surfaces.
12466 F. E. Andé. Valve gear for steam engines.
12513 F. H. Alexander. Propelling floating vessels.
12543 C. J. N. Carpentier. Steam boilers.
12600 A. Alison. Means for superheating steam.
12659 H. E. Newton (C. C. Worthington, United States). Steam pumps.
12664 M. P. Duggleby. Ships.
12666 G. S. Eckford. Lubricator.
12691 A. J. Boult (J. W. Glaholm, Canada, and C. Salmond, United States). Discharging cargo.
12702 W. B. Brown. Draught ropes of steam trawlers.

BOARD OF TRADE EXAMINATIONS.

Note.—1C denotes First Class; 2C, Second Class.

May 23rd, 1896.

Adamson, W. J.	2C	Glasgow
Airey, R.	1C	W.H'pool
Barter, E. G.	2C	Cardiff
Bateman, W. A.	1C	W.H'pool
Bavly, R. H.	2C	Glasgow
Bettoney, S. W.	1C	Liverpool
Callender, G. R.	2C	W.H'pool
Campbell, J. H.	1C	N.Shields
Cartnell, B. L.	1C	S'th'pton
Clarke, H.	2C	Liverpool
Evans, E.	2C	Cardiff
Gledhill, J.	2C	Liverpool
Good, W.	2C	Glasgow
Gurney, G. E.	2C	London
Harlow, A. J.	1C	Cardiff
Jamieson, A.	2C	Glasgow
Johnson, C.	1C	W.H'pool
Johnstone, A. E.	2C	London
Keightley, M.W.	1C	W.H'pool
Langley, O. A. J.	1C	Cardiff
Lindsay, G.	2C	W.H'pool
Louttit, J. D.	1C	Glasgow
Mavromatis, J.	2C	Cardiff
M'Donald, W. C.	2C	W.H'pool
McDonie, P.	2C	,,
McIntyre, W. F.	1C	Glasgow
Metcalf, T. J.	2C	W.H'pool
Morton, J.	2C	N.Shields
Munyard, A.	1C	London
O'Brien, J.	2C	Cork
Ogle, S.	2C	L'd'nd'ry
Phaver, J. R.	2C	London
Rankin, G. J.	1C	,,
Rawson, F. G. R.	1C	W.H'pool
Reid, J. A.	2C	London
Richards, J. T.	2C	Cardiff
Richardson, G.	2C	Liverpool
Rowland, M.	1C	London
Sharpe, A. T.	2C	Glasgow
Smith, A.	2C	W.H'pool
Smith, J. C.	1C	London
Steel, A.	2C	Glasgow
Woodward, W.H.	1C	Cardff

May 30th.

Bowran, J.	1C	N.Shields
Brown, S. C.	1C	London
Carter, A. E.	1C	,,
Chapman, H. E	2C	,,
DelEspino, A.M.	2C	,,
Dunn, J.	1C	S'derland
Gibson, E. A.	2C	London
Gourlay, D.	1C	Aberdeen
Graham, Samuel	2C	Liverpool
Kairis, A. Z.	1C	London
Macdonald, G.	1C	,,
McGill, J.	1C	,,
Morris, W. M.	2C	Aberdeen
Phin, A. W. P.	1C	London
Reid, J.	1C	N.Shields
Roberts, John W.	2C	Liverpool
Saunders, J.	2C	London
Smith, W.	2C	Aberdeen
Stiles, C. E.	2C	S'nd'land
Suttie, G.	2C	Aberdeen
Swinton, D.	2C	,,
Taylor, J.	1C	S'nd'land
Tickle, John F.	2C	Liverpool
Waterson, J.	2C	Hull
Watson, John H.	2C	Liverpool

June 6th.

Beard, R.	1C	Dublin
Brown, J. W.	2C	Cardiff
Chalmers, H.	2C	Glasgow
Chisholm, K.	2C	,,
Colsell, R. H.	2C	Liverpool
Cullum, W. H.	2C	Hull
Dodson, A.	1C	Cardiff
Erskine, R. L.	1C	Glasgow
Fairlie, D.	1C	,,
Gale, F.	1C	London
Heron, C.	2C	Glasgow
James, T.	2C	Cardiff
Jones, D. M.	2C	Hull
Lewis, W.	2C	Cardiff
MacCrone, J.	1C	Glasgow
Mannion, D. J.	2C	,,
McChlerie, R.	1C	Liverpool
Milligan, R.	1C	Dublin
Morgan, J. D.	1C	Cardiff
Murphy, James	1C	Liverpool
Paterson, W.	2C	Glasgow
Pollitt, F. W.	2C	London
Reid, R.	1C	Glasgow
Reid, William	2C	Liverpool
Scott, Archibald	2C	,,
Scott, J.	1C	Glasgow
Scott, John	1C	Liverpool
Sgouros, Geo. A.	1C	,,
Smith, A.	2C	Glasgow
Steele, E. S.	2C	,,

June 13th.

Bevan, William	2C	Liverpool
Black, J.	2C	Greenock
Bocock, W. A.	2C	London
Boden, G. C.	1C	,,
Brock, W.	2C	Leith
Brown, J. D.	2C	Cardiff
Brown, W. T.	2C	Leith
Clark, J.	1C	Greenock
Cochrane, J. F.	1C	Leith
Fergus, A.	2C	Greenock
Gibbon, J. R. J.	2C	Cardiff
Hanratty, T.	1C	N.Shields
Jacobsen, A. J.	2C	London
Jones, D.	2C	Cardiff
Manners, C. E.	1C	London
Matthewmair, J.	1C	Liverpool
McIndoe, W.	2C	Greenock
Morris, W.	2C	Cardiff
Paterson, J.	1C	Leith
Ridge, J. A.	1C	,,
Robson, W.	1C	N.Shields
Rowell, R.	2C	,,
Taylor, J.	1C	,,
Thomas, F.	1C	Leith
Thomas, S. J.	2C	Cardiff
Whiting, T.	2C	N.Shields

June 20th.

Abbott, A.	2C	London
Atkins, C. A.	1C	Plymouth
Baker, W. C.	1C	London
Barnes, J. J. W.	1C	Plymouth
Barrow, J. W.	2C	London
Brown, J. W.	1C	W.H'pool
Cameron, P.	2C	Glasgow
Croker, Jos. H.	2C	Liverpool
Duncan, J. S.	1C	Glasgow
Errington, T.W.	1C	London
Garrick, W. H.	1C	W.H'pool
Grant, G. McL.	2C	Glasgow
Greenwell, E.	2C	N.Shields
Harrison, W. H.	1C	Glasgow
Hewitt, R.	2C	,,
Horsburgh, L.	2C	London
Linton, J.	2C	N.Shields
Reid, G. L.	1C	Dundee
Robinson, F.	2C	W.H'pool
Rolfe, H. J.	2C	London
Sargeant, H.	2C	,,
Scarfe, H. J.	1C	,,
Shield, J. W.	1C	W.H'pool
Short, A.	1C	Glasgow
Stirrat, M.	2C	,,
Stout, William	2C	Liverpool
Strachan, J.	1C	London
Thompson, W.S.	2C	Dundee
Watson, W. S.	2C	London

Vessels transferred to Foreign Flags.—A return has been. issued showing "the numbers of British vessels transferred to foreign flags since January 1st, 1896, by sale of vessel." The total number of vessels thus transferred is 173, of 95,295 tons register and 132,195 tons gross. This is, of course, an infinitesimal proportion of the total tonnage of the vessels belonging to the United Kingdom, which was 10,504,662 tons register on December 31st, 1895. Of the vessels transferred 33,935 tons register were sailing craft.

[REGISTERED FOR TRANSMISSION ABROAD.]
Vol. XVIII. No. 209. AUGUST 1, 1896. PRICE 6d., by Post, 8d.

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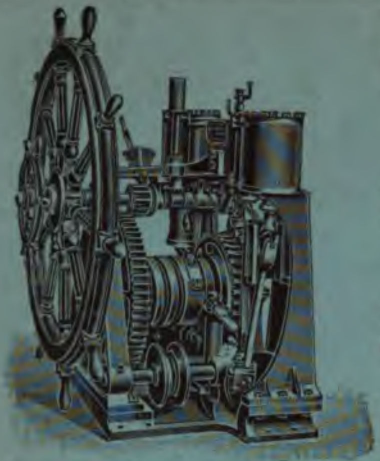
See page x for particulars.

For Index to Contents, see page xix. For Index to Advertisements, see page xvii.



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MARINE ENGINEERS

WRITE

To the United States Metallic Packing Company, Ltd.,
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FOR MARINE CATALOGUE (A).

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The Marine Engineer.

LONDON, AUGUST 1, 1896.

THE efforts of inventors to perfect a reliable submarine boat for purposes of warfare have not been yet abandoned. The partial successes heretofore attained, which have generally been accompanied by unexpected difficulties and drawbacks, seem only to have whetted the appetites of inventors to conquer the difficulties as they have appeared. The general principles for a submarine boat seem at first sight more easily realisable than they have proved to be in practice. The sinking of such a boat or vessel by the admission of water until the increased specific density causes the boat to sink, would appear to be an easy solution of the main part of the problem, with the lightening of the boat at will by the ejection by pumping of the water to cause the boat to rise, but the difficulties and dangers attending this system are great. Any increase of buoyancy upon a submerged body at different depths varies very little, if at all appreciably, in ordinary depths of immersion. Once, therefore, the boat has received an increase of weight to cause it to slightly sink, it may continue to sink almost indefinitely within considerable ranges of depth, and if dependent upon its own mechanism to rise to the surface again, any failure of the mechanism would doom the crew to a horrible death. For the means of propulsion also the use of fuel for the generation of steam power in the usual way would appear to be barred by the circumstances, both of the total necessary immersion of the boat precluding a supply of air or the escape of gases of combustion beside the inability of a crew under such circumstances being able to support the accumulated heat of an internal furnace. Electricity would appear to be the only applicable force under the circumstances, but great refinement and perfection of any electrical storage batteries must be arrived at to give any lengthened power of cruising without such an excess of weight as would prove impracticable. In the matter also of the maintenance of a breathable atmosphere during a reasonable time of immersion, to provide safety by flight under the surface—this is not so easy a problem as it seems. Though theoretically the main impurity of vitiated atmosphere—viz., carbonic acid—may be readily absorbed chemically, and fresh supplies of oxygen obtained also chemically by known means easy to experienced chemists, it has been found that an atmosphere so treated is still after some use greatly deleterious to human life, and that much has still to be done to enable a given atmosphere to be constantly respired with comfort and without injury to human life. We have, however, had an opportunity of seeing some most interesting demonstrations of a submarine boat embodying the combined ingenuity of three experts, viz.:—Messrs. Allan, Manville & Purcell, in which it is claimed, and apparently with good reason, that all the above-mentioned difficulties have been met and conquered. The boat is so constructed that it is always maintained of such buoyancy as to naturally float upon the surface, any submergence being effected by the internal action of its driving mechanism, and this is exerted in such a way that it can sink or rise vertically, that is to say, independently of the way on it and at any desired angle of bow or stern from the horizontal or in the horizontal position. It can be then maintained at any desired mean depth and travel in any direction at that depth, and in case of any breakdown of the machinery the boat will at once float to the surface. The force employed is of course that of electricity, for which the latest improvements in storage batteries and in motor mechanism have been arranged and devised by Mr. A. Manville, the well-known electrician. The problem also of the maintenance of a perfect respirable and unchanged atmosphere within the limits of the boat has also been solved by the well-known chemical and engineering expert, Mr. M. F. Purcell, for practically any length of time, and the joint inventors or perfectors are prepared personally to put this to any desired test by themselves engaging to remain below the surface for a week or weeks, or any reasonable time. Of course the details of propulsion at a good speed, the lighting of the boat internally and for the purpose of directing her course by sight under water, have been fully dealt with, and, further, the difficulty attaching to the use of magnetic compasses within such a boat has been overcome by the application of a gyroscope as an indicator of a true course when once the direction of motion has been determined, say, before submergence, when the object of attack, or *point d'appui* is visible above water from the conning tower. The boat is provided with a longitudinal fin along its back, affording a protection to the conning tower and search-light lantern. The demonstrations of a lengthy model which we had the pleasure of personally witnessing at the St. George's Baths, Westminster, were most convincing as to the practicability of this submarine boat, and the part it was likely to play in future naval warfare.

LORD CHARLES BERESFORD is still hammering away at Navy reforms. To a crowded and influential meeting in Liverpool he has been giving his views most precisely as to what is necessary, in his opinion, for the proper and efficient manning of the Navy. There is always this to say for any of Lord Charles Beresford's criticisms and schemes, that he invariably reduces them to some positive and definite proposal; and we have some sympathy with the stand he takes, that he will disregard all criticism except such as is associated with an equally definite counter-proposal. He first points out the actual and lamentable deficiency of crews afloat in 1895 as compared with the Admiralty paper figures, and he puts that actual deficiency down at about 10,000 men. But for the forty-six new ships building they would want another 11,200. He considers we ought to have 105,000 men in training, as out of that number we should get absolutely about 100,000 men efficient. It would not be possible to get a good class of men for mining, telegraphy and other similar services under seven years' training. The British Naval Reserve was a farcical quantity at 24,792 as compared with the Naval Reserves of other countries with not half our Navy. France has a reserve of 135,000 men. Italy over 100,000, and Russia about the same. The neglect of suitable training for the Reserve also, which we have always lamented as regards the Engineers, much militated against the efficiency of such Reserve, though composed of the finest material. The supply of ready-made seamen from the Mercantile Reserve is a fast disappearing quantity, 40 per cent. of the men in the Mercantile Marine being foreigners, and in such circumstances it would be dangerous and impossible to withdraw any sensible number of the present British seamen from the Mercantile Marine. Lord Charles very characteristically broaches a bold proposal, that instead of relying upon the Mercantile Marine to supply untrained crews for mobilisation and waste in case of war, the Navy shall be made the nursery for the Mercantile Marine by training up short service Reserve men with graduated annual service afloat in the Navy according to a first-class and second-class scale. We think there is a great deal in this idea, many of our fishermen and coasting sailors would be too glad to take their occasional cruises at full pay on board Her Majesty's vessels and draw a more substantial and reasonable subsidy as a Reserve man for the rest of the year. For a first-class Reserve his Lordship proposes that 5,000 men should be obtained for a five years' service in the Navy and then receive a fee of £12 a year subject to 28 days drill in each year. In addition he proposes to obtain 5,000 as a second-class reserve, to get two months' training in each year and to receive a retaining fee of £8 per annum. It is almost certain that men not employed in the winter could easily be got for this service. In a few years the Navy would have a large body of men—say 35,000 first-class and 35,000 second-class—in constant training, and these would be invaluable adjuncts to the Mercantile Marine. All this would of course cost money, but as the nation has unanimously committed itself to a heavy expenditure for new ships it is useless to spoil the ship for a ha'porth of tar, and a million or more spent in maintaining such a reliable Reserve, which would form also such a backbone to the Mercantile Marine, is well expended. We congratulate Lord Charles that he has at least given us something definite to think over rather than empty talk.

"A HOUSE divided against itself cannot stand," is a trite but true saying, and we trust that the last ridiculous development of a trade strike in Messrs. Thornycroft's works, where the dispute lies between the Boilermakers and Iron Shipbuilders' Union on the one hand, and the Amalgamated Society of Engineers on the other, will prove the *reductio ad absurdum* in these trade disputes. The matter has arisen out of the new manufacture of water-tube boilers which is at present very brisk with Messrs. Thornycroft & Co., or which would, at least, be very brisk if the workmen could only agree as to who is to do the work. The new water-tube boilers are built by pipe fitting to other tubes and to connecting chambers, which in its character is essentially fitters' work, but inasmuch as the ultimate product is a boiler, the Boilermakers' Society has claimed the work for its members whether they can do it or not. Unfortunately, we think, Messrs. Thornycroft stretched their consideration and courtesy to the Unions so far as to attempt to divide the work between the boiler-makers and the fitters, with the result, so well foretold in Æsop's Fables, that they have pleased nobody, and the two bodies of men instead of uniting to aid one-another to a practicable result have merely put all sorts of obstructions in each other's way, and the boilers do not get finished at all. The matter has been referred to arbitration by the employers but the men can't agree as to the terms of the arbitration. The fitters will strike if the boiler-makers do the work which apparently they are not fitted or trained to do, and the boiler-makers will strike if the fitters do the work, and both will strike if outsiders are brought in to put together and test the finished parts, so there seems no way out of this ridiculous quarrel but the employers to close their works until the men come to their senses, or until the employers cut themselves adrift from such stupidity and tyranny. In the meantime Government orders are under penalty for completion and foreign Governments will find a market most to their liking in Germany or elsewhere abroad where production is as yet not hampered and disorganised by these irresponsible bodies. It is now nearly twelve weeks since the work was stopped and no solution has yet been arrived at. We suggest that no manufacturer can succeed in his trade who allows the Unions in anyway to interfere between them and their workmen, or who admit any control or hearing to such irresponsible bodies who exist and live only upon quarrels and conflicts.

MESSRS. POSSEHL'S COAL WHARF AT ALTONA.

WE have been favoured by the proprietors, Messrs. L. Possehl & Co., of Hamburg and Lübeck, with the photographic view, sectional elevation, and plan, which we herewith reproduce, of their new "Kohlenhof," at Altona.

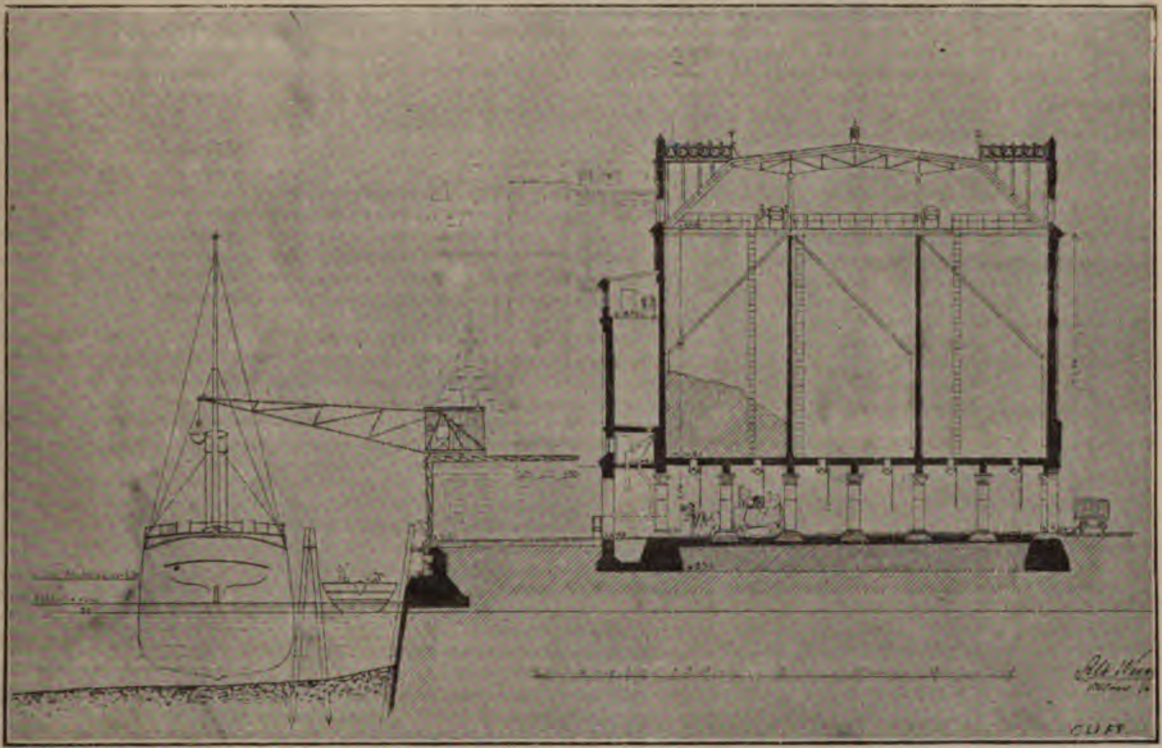
This establishment is designed for discharging English coals, and, when the connection between the Rhine and Elbe has been accomplished, Westphalian coals also, from vessels, and subsequently to warehouse, screen and deliver them into carts or waggons as required.

The building, having a handsome elevation, is, as will be seen from the general view, built in the Gothic style, red brick with a moderate quantity of glazed bricks being used in the structure, which is situated on the Gr. Elbstrasse.

The system adopted is that of housing the coal in large store-tanks, of which there are fifteen in all, six being of twenty-one metres high, extending from the ground, and nine of fifteen metres high, carried by wrought-iron columns, beams and girders, three of the latter being shown in the sectional elevation, from which it will be seen that the space below serves as a delivery hall, connected with the street on one side and the quay on the other.

Each tank holds 800 tons of coal, and has its walls constructed of mortar and gravel pounded into the panels of the iron framework.

The high wrought-iron tower on the right of the building is provided with an elevator, and connected with the warehouse by two bridges, the lower one carrying a belt transporter which is connected with the elevator, and at the delivery end of which is placed a self-registering weighing machine, by which the coals are weighed before delivery into the warehouse, whence they are transported and discharged into the tanks by a second fixed elevator and three belt transporters, the total capacity being about sixty tons per hour.



Messrs. Possehl's Coal Wharf at Altona.—Transverse Sectional Elevation.

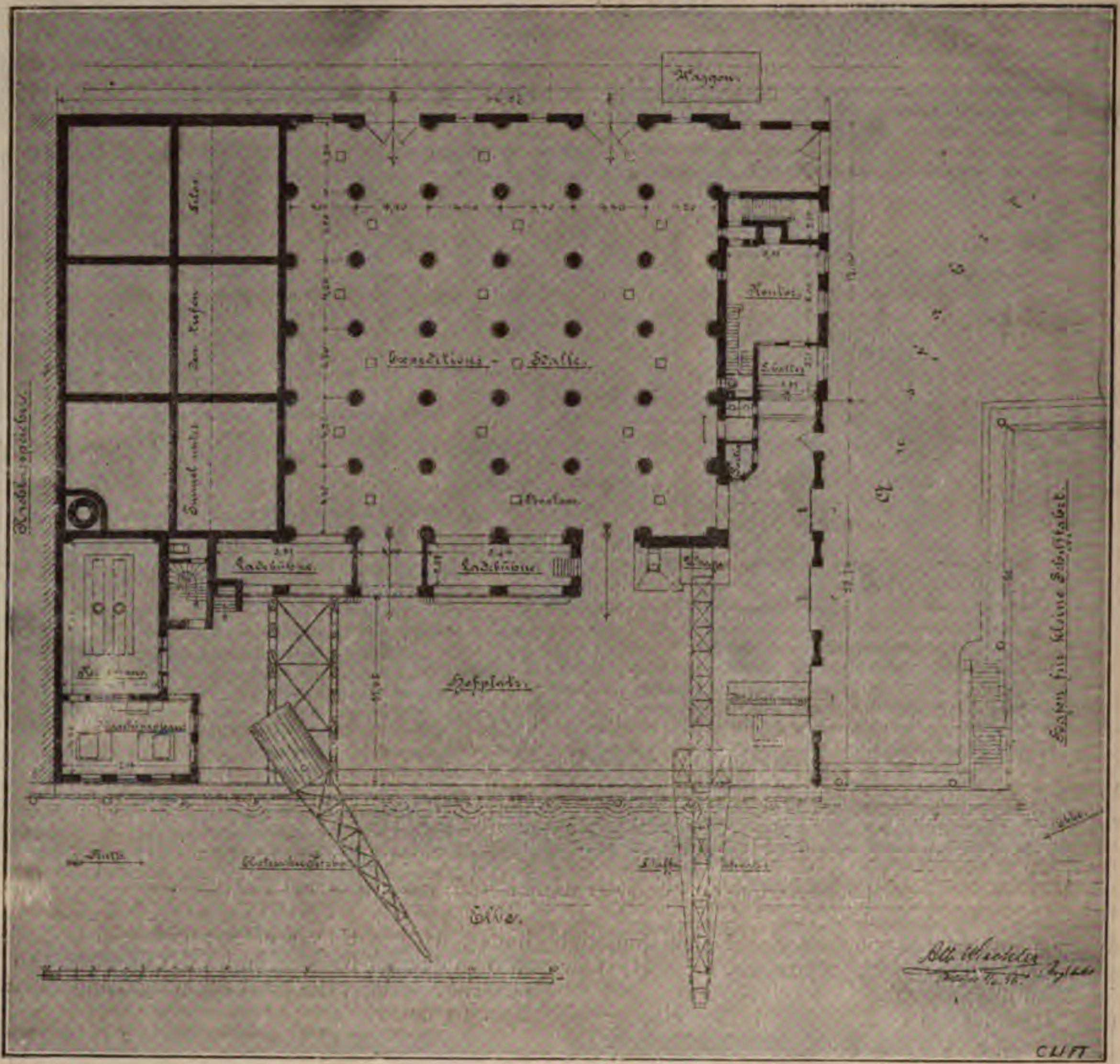
The emptying of the nine shallow tanks, reserved for screened coals, is effected direct into carts by means of spouts and a tilting registered measuring vessel.

The six deep tanks are loaded up with unscreened coals by means of belt transporters running on the upper bridge of the tower, their discharge being effected by a moving scraper which runs through a tunnel under the tanks, and connected with an elevator and belt transporter by which the unscreened coals may, if desired, be conveyed into the screening tanks, the screening arrangements being such that the screened coals run into the loading stages, while the dust falls into the cellars below. The screens are manipulated from the loading stages, where also the delivery can be made by officially registered measures. At the gateway, near the offices, a weighbridge is placed for use when the coal is sold by weight.

A movable electric crane, placed on the quay, has a radius of fifteen metres, and serves to lift coal simultaneously with the elevator, but from another hold of the ship, and to deliver them into carts and lighters.

The whole of the machinery is worked by electrical power, the current for which is generated in the engine-house by dynamos coupled direct to two steam engines, each of 50 H.P., steam being supplied by two Babcock & Wilcox water-tube boilers. The whole of the building and quays are lighted by electricity.

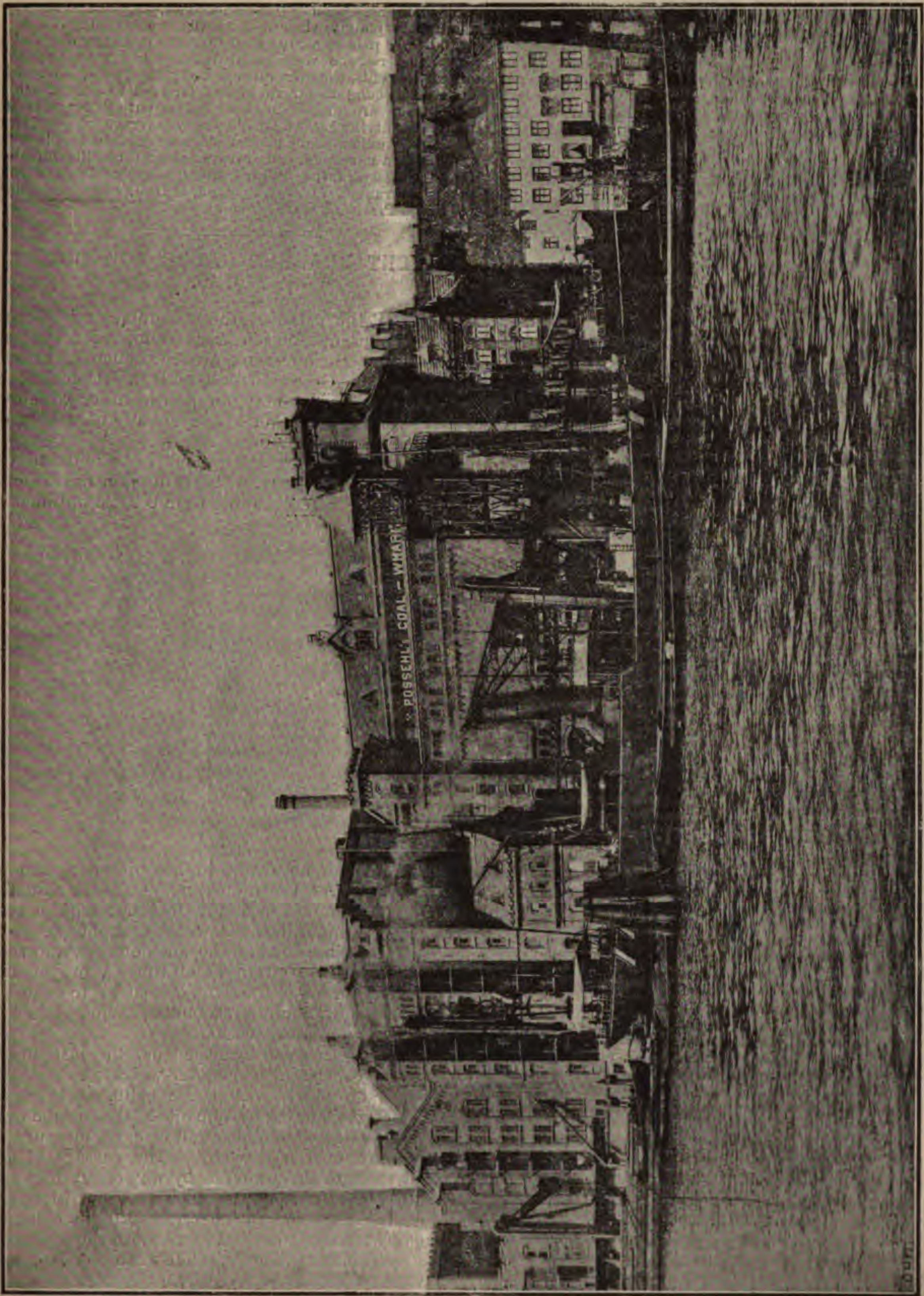
We may state that all the buildings, including the ironwork and quay wall, were erected by F. H. Schmidt & Co., of Altona, according to the plans of the architect, Herr Alb. Winkler, of the same town.



Messrs. Possehl's Coal Wharf at Altona.—Plan.

IRON TRADES' EMPLOYERS' ASSOCIATION.

THE twenty-fourth annual meeting of members of the above association was held on Wednesday, the 22nd ult., at the Station Hotel, Hull, Mr. A. E. Seaton, President, occupying the chair. The annual report of the general committee, which was presented and adopted, was of a satisfactory character, and stated that during the past year there had been a considerable improvement in the shipbuilding and engineering trades—as would be seen from the summary of reports which was given of what had taken place in the various districts connected with the association during the past twelve months. We select from these summary reports those having special reference to the principal marine engineering and shipbuilding centres of industry. In the London district trade is reported in some cases as good, but some firms reported it as slack though improving. Prices, however, are unremunerative. In one or two firms trade has been brisk. There had been demands made by several classes of workmen for advances in wages, and in some cases they had been slightly increased, but there had been no general move in this direction. In London the employers continued to pay the


POSSEHL'S COAL — WHARF

Messrs. Possehl's Coal Wharf at Altona.—General View.

highest rates in the kingdom. The boiler-makers had objected to working overtime, but this matter was in abeyance. There had been no particular move as regards piecework, but the boiler-makers had raised the apprentice question. There had been some difficulty in getting really good men in certain trades. In Liverpool, except one or two firms, trade could not be said to be good. Good skilled hands were, however, not easy to get. Both time and piece rates had been advanced, though the state of trade hardly warranted it. There had been nothing particular to disturb the good relations with the men, the question of wages only having been discussed. Trade in the Manchester district might be described as fairly good, although in many cases prices were still unremunerative. There had been no movement for a general rise in wages, though various small bodies of men were trying to force up the rate. As Manchester was nearly the highest paid district in the kingdom, and no attempt was made in recent bad years to reduce wages, any attempt now to force them up would probably be stoutly resisted. At Oldham a move had been made by the moulders for an advance, and in several places round Manchester there seemed to be a tendency to try and raise them up to the Manchester level. This was looked on with extreme disfavour by the employers, as from time immemorial rates had been 2s. less in the district than in the town itself. Some time ago individual employers received a notice from some of the societies regarding a limitation of overtime. Skilled labour was scarce; piecework was stopped by the societies as far as possible, except where it had always been customary, and there had also been a movement to stop the employment of labourers on machines. In Newcastle, firms which had been employed on Government work for the last year, had been and were very busy, but the mercantile trade was not reported good. Wages had been considerably advanced in both engine shops and shipyards, and a considerable portion of the recent reductions had been given back. All the leading societies had benefited by this arrangement. The restrictive conditions of overtime had, however, been done away with, the men not being satisfied with it, and the employers were very glad to give it up. There had been some difficulty in procuring good men. This had been a quieter year locally than for some time, as far as relations between masters and men went, though earlier in the year there seemed to be a prospect of a considerable wages dispute, which was, however, fortunately settled. The state of trade on the Wear was about the same as on the Tyne, the mercantile trade being not brisk. The labour market had risen in consequence of the employment given by orders for warships elsewhere. Early in the year the same causes that affected the Tyne almost led to a serious wages dispute with the Amalgamated Society of Engineers. There had been a considerable advance in wages, both piece and time rates, all round. Considerable difficulty was experienced in getting shipwrights and joiners in shipyards. The house-building trade being brisk had had some effect as regards joiners—the latter demanding a still further increase in their wages. At Hull trade was good, and efficient workmen, especially in the engineering trade, hard to get. There had been no particular movements of general interest, but a considerable advance in wages, both in engine shops and shipyards had been granted, most of the principal classes of workmen having participated in the rise. Trade had been fair in Barrow-in-Furness, a considerable amount of Government work having kept the various departments busy. There had been moves for advances in wages all round, which had been practically conceded.

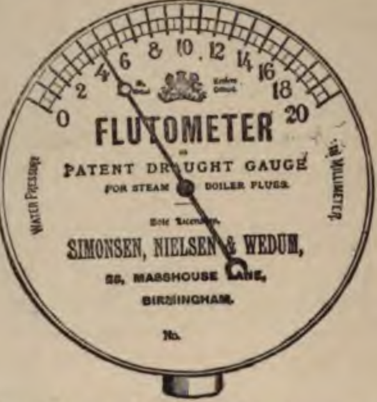
Summing up generally, the report states that, on the whole matters might be considered fairly satisfactory. The Association was, the committee are glad to say, able to be of some assistance to the Taff Vale Railway Co., last year, in getting men for the company during a dispute. Towards the close of the year a demand by the men at Belfast and on the Clyde for increased wages, brought about, unfortunately, a prolonged strike and lock-out, which had now happily terminated, and had led to a very much closer combination among the employers in the north. No advance had been made in respect of the eight hours' movement. With regard to Parliamentary matters, the report adds that the Employers' Liability Bill had this year made no progress, and it was unlikely there would be a fresh Act during the present session. The Machinery Rating Bill was still in *statu quo* and the Conciliation (Trades Disputes) Bill had been read a second time and was now in Committee.

The report concludes with an appendix which consists of a special report prepared by Mr. W. E. Stark, the actuary, on the financial condition of the Amalgamated Society of Engineers, who brings out a deficiency of £1,430,914, and adds that his report plainly showed that the weekly subscription of 1s. 6d. now paid was quite inadequate to meet the demand of the members who were entitled to, or had been promised, certain benefits, the principal one being superannuation, which even the young members looked forward to participate in, when they are unable to work. The outlay for this was increasing at the rate of £3,700 yearly (average of past three years) and unless some urgent steps were taken to place the society on a more substantial financial position, the members of the society in the future could not expect to have their demands granted. Mr. A. E. Seaton, of Hull, was unanimously re-elected President for the ensuing year.

PATENT DRAUGHT GAUGE FOR BOILER FLUES.

UNDER the name of the "Flutometer" Messrs. Simonsen, Nielsen & Wedum, of 28, Masshouse Lane, Birmingham, are introducing, as sole licensees for Great Britain and the Colonies, to engineers in this country, an instrument of which we are told upwards of 8,000 have already been sold on the Continent.

The object of the instrument is to indicate the pressure of the draught, which it does, in the example illustrated, by direct reading from 0 to 20 millimetres of water, though no doubt higher pressures can be arranged for. As the indicating needle is actuated by purely mechanical means it does not require constant readjustment like the water draught gauge, or frequent re-calibration like the anemometer, and thus it is possible to maintain at all times a proper and accurate regulation of the dampers, so as to ensure a uniform draught, and corresponding saving of fuel in all states of wind and weather.



From the description furnished us, the instrument appears to consist of a counter-weighted vane, the movement of which within the cylindrical casing causes a corresponding movement of the needle over the dial, the degree of deflection being a measure of the pressure of the draught. The passage of the draught through the casing is by way of an inlet and an outlet placed at opposite sides of a partition, the outlet being adapted for connection with the chimney or flue of which it is desired to measure the draught.

The instrument is simple, reliable and cheap, and well worthy the attention of all interested in the question of efficient and economical stoking.

A NEW PLEASURE STEAMER FOR CARLINGFORD LOUGH.

THE *Pioneer*, a little steamer possessing several interesting features, recently commenced her daily runnings from Warrenpoint, the object being to allow visitors to make a cruise round Carlingford Lough at any state of the tide.

The vessel, 60 ft. long and 14 ft. 6 in. beam, is of very light draught, drawing only 20 in. forward and 33 in. aft, and is certified to carry 166 passengers.

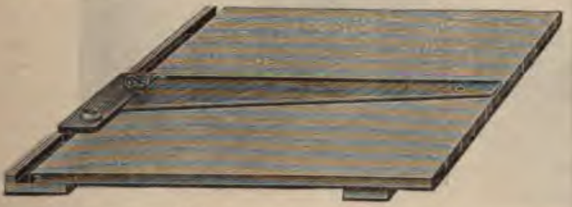
The engines, made by Messrs. Robey & Co., of Lincoln, have cylinders 5½ in. diameter and 5 in. stroke, and are of the high-speed balanced type, usually employed for electric light purposes. When running noiselessly at the normal speed of 300 revolutions, the engines drive by means of 3 to 1 skew gearing, the propellers at 100 revolutions. These speeds can, however, if required, be increased to 400 and 133 revolutions respectively. The propellers, constructed under Mr. Henry Barcroft's patent, are 4 ft. 10 in. diameter, and 6 ft. pitch, the depth from the surface of the water to the lowest part of the blade being only 27 in., and when running at the normal speed of 100 revolutions, drive the boat at about 7 miles an hour with—owing to the peculiar construction of the blades—very little back wash.

The little vessel has a neat and attractive appearance, there being no deckhouses or other erections to impede the deck, other than a small covering over the engines (placed aft) which, rising only a few inches above the level of the bulwarks, and being panelled with canary wood, adds rather to the yacht-like look of the craft, which is still further enhanced by a very handsome awning of Willesden canvas.

Now that all the arrangements have been completed for the erection of a jetty at Rostrevor, a structure which is to be 360 ft. long, and sloping towards the sea, so as to allow a landing at the lowest tide, we trust that the *clientèle* of the *Pioneer* and the district she serves may steadily increase.

THE STANLEY-HOWARD PATENT COMBINED DRAWING BOARD AND TEE SQUARE.

THE combined drawing board and T square, which we herewith illustrate should specially commend itself to marine engineers in that the square will not slip off the board, while further it may be clamped in any position, thus allowing perfect freedom of both hands when working with the set square.



As will be seen the board is made with one end ledge rabbited over the working edge, which is thus protected from injury. The ledge is of hard wood, and is grooved for the lower stock of the square to work in. The square, made with the stock upon the upper surface of the blade, extending to the drawing edge only, has a second stock of the ordinary form placed underneath this, and affixed by a centre so that it may move within certain limits to set the blade to an angle, at which it may be clamped. Through the centre, attaching the two stocks, a bolt passes having fixed to its upper end a lever and to its lower end a cam, so placed that the square, the lower stock of which runs perfectly free in the groove, may be used in every way as an ordinary square, or by a slight turn of the lever the cam may be made to come in contact with the side of the groove (farthest from the working edge) and thus forcing the stock hard up to the working edge, the square may be locked in any position desired, an index on the two stocks showing when the blade is truly square with the stock.

The combination is strong and portable, *desiderata* not to be lost sight of in the restricted space of engineers' quarters, while the name of the maker, W. F. Stanley, of Great Turnstile, London, W.C., is ample guarantee for its quality and workmanship.

ROPER'S PATENT LIFE-SAVING APPLIANCES.

WE recently attended, in company with a large number of gentlemen connected with the Royal Navy, the Mercantile Marine, and the Press, a practical demonstration of various patented life-saving appliances, as manufactured by the patentees, Messrs. Roper & Son, of Palace Chambers, Westminster, S.W.

The firm's several inventions comprise, amongst others, a new unsinkable multi-keel life-boat, steel built, and subdivided into numerous watertight compartments. These boats are provided with extra and large (subdivided) side buoyancy chambers, carry air-tight lockers for food, water. blankets, signals, etc., and, being built entirely of steel, there is nothing to deteriorate through climatic action, and thus "dry-rot," with its attendant sagging, warping, and leaking, is entirely eliminated.

These boats are sold at a cheaper rate, and are about 20 per cent. lighter than the present type of wooden boat, a 32 ft. Navy wood cutter, weighing, fitted, 22 cwt. 3 qrs. 14 lbs. as against 18 cwt. 1 qr., the weight of a 32 ft. Roper steel cutter, similarly fitted, in addition to which the "life" of the steel boat is considerably longer, and owing to their peculiar construction they are steadier in a sea way, while their strength and consequent ability to withstand shock and strain, is enormously superior to the wooden boat.

The firm also make a patent boat-releasing gear, which possesses the great *desiderata* of rapidity and unfailing certainty of action, whether for releasing or picking up a boat, combined with extreme simplicity, ample strength, and lowness of cost.

A life-saving raft, two of which are fitted on H.M.S. *Polyphemus*, also attracted a considerable share of attention. This raft may conveniently form the superstructure of the captain's bridge, and weighing only 6 tons, is capable of carrying 400 men with all necessary provisions, stores, &c., and like the firm's patent boat, is constructed of steel and divided into a large number of watertight compartments.

An eminent naval officer, writing in reference to these rafts says, "They were worked constantly . . . . . the actual launching was performed in 45 seconds, and could be done quicker in case of emergency." Another officer (Captain R.N.) writes, "This plan is *certainly* the best and most suitable for passenger steamers and transports." As compared with the present wooden boats, one of these rafts costing £450, and weighing, fitted, 6 tons, will replace 10 boats costing in all £1,400, occupying nearly four times the deck space, and weighing, fitted, 35 tons, carrying in either case the same number of people, those on the raft being, however, carried with infinitely greater comfort and safety.

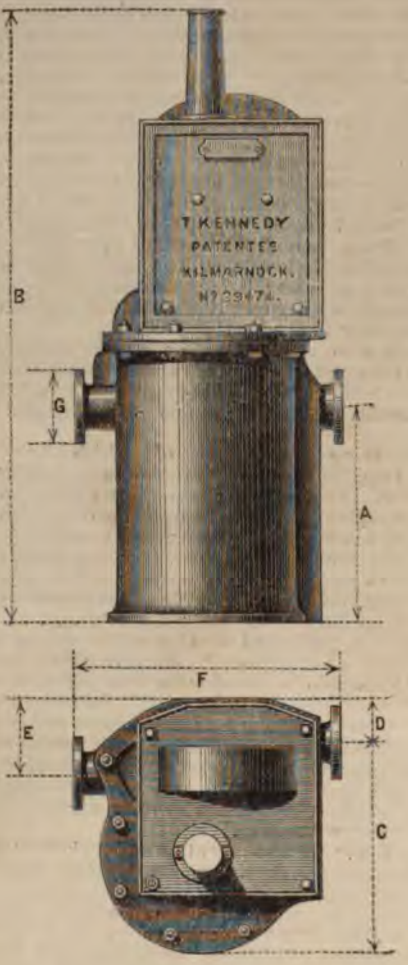
Messrs. Roper are also patentees and makers of several very serviceable forms of davits. One arrangement capable of lifting outboard and holding clear of the vessel's side a second-class torpedo boat in two minutes, struck those naval officers present as being a great improvement on anything of the kind they had seen before, combining, as it does, the maximum of strength with the minimum of weight and exposed target area, together with the least possible number of working parts.

A powerful arrangement of davits for quickly lifting and lowering boats from the shade deck, and also davits and arrangements for dealing rapidly with boats stowed on the rail, came in for general attention, and it was shown that with either arrangement a boat could be cleared and got two men and water borne in under two minutes, the labour attending such operations being greatly diminished, and much valuable time saved, when the boats are secured, as those tested were, by Roper's Patent Automatic Releasing Chocks and Skids. All the firm's davits are hollow and the falls, of steel wire rope, pass through them, thus effectually preventing all danger from freezing or fouling.

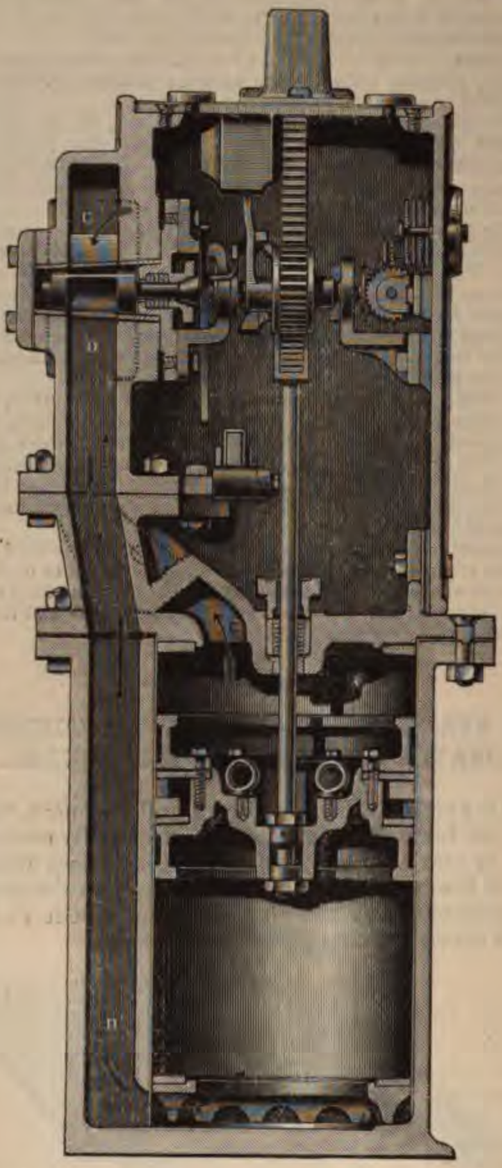
As we propose illustrating several of the firm's productions in a future issue we have here only briefly referred to a few of the leading points, but any further information desired will, we have no doubt, be supplied by the makers, whom we understand are arranging for the simultaneous working of their patents in France, Germany, and Italy as well as in the English markets.

KENNEDY'S PATENT FEED-WATER METER.

IN these days of rapid strides in the improvements of marine engines and boilers, it is every day becoming a more urgent necessity that engineers in charge should be able to gauge easily and correctly the performance both of their engines and boilers, and that the general effect of maximum economy either in evaporation in the boiler or effective use of the steam in the engines should be readily gauged under different circumstances.

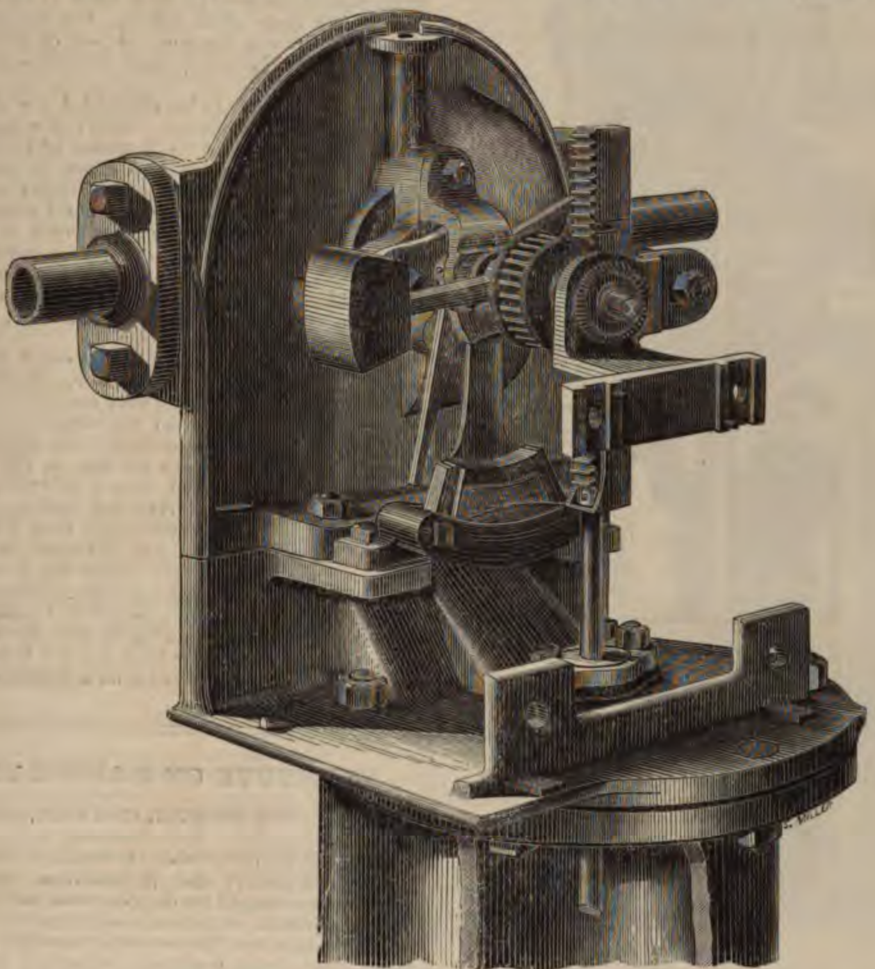


The old-fashioned method of gauging efficiency by the comparison of I.H.P. with the consumption of fuel alone is a most laborious and lengthy method of attempting to arrive at such results, is liable to considerable error in the measuring of the coal, and is imperfect in its analytical results because it does not distinguish between the evaporative efficiency of the boiler and the effective economy of the engine per lb. of steam actually evaporated.



The use of a feed-water meter gives most accurately and at any time the actual amount of water being evaporated unaffected by any variation in the efficiency of the engine. The comparison between the fuel burnt and the actual feed-water evaporated gives absolutely the efficiency or rate of evaporation of the boilers at any time, and under any variation of circumstances or draught, and the comparison of the I.H.P. of the engines with the weight of feed water actually evaporated or turned into steam will give the actual efficiency or duty of the engines under various grades of expansion, or under any variation of circumstances that it may be desired to test.

Kennedy's Patent Water Meter, made by the Kennedy's Patent Water Meter Co., Limited, of Kilmarnock, N.B., which we have pleasure in illustrating herewith, has been adopted by Mr. Frederick Edwards, M.I.M.E., M.I.N.A., in his work for the Marine Research Committee, and is reported to have given entire satisfaction as an accurate and reliable instrument.



The construction and design of this meter is most simple and ingenious, and that it is a marvel of frictionless working is shown by the fact that the largest instruments will operate with a minimum head of 4 in. of water which may increase up to 3 ft. in the smallest size.

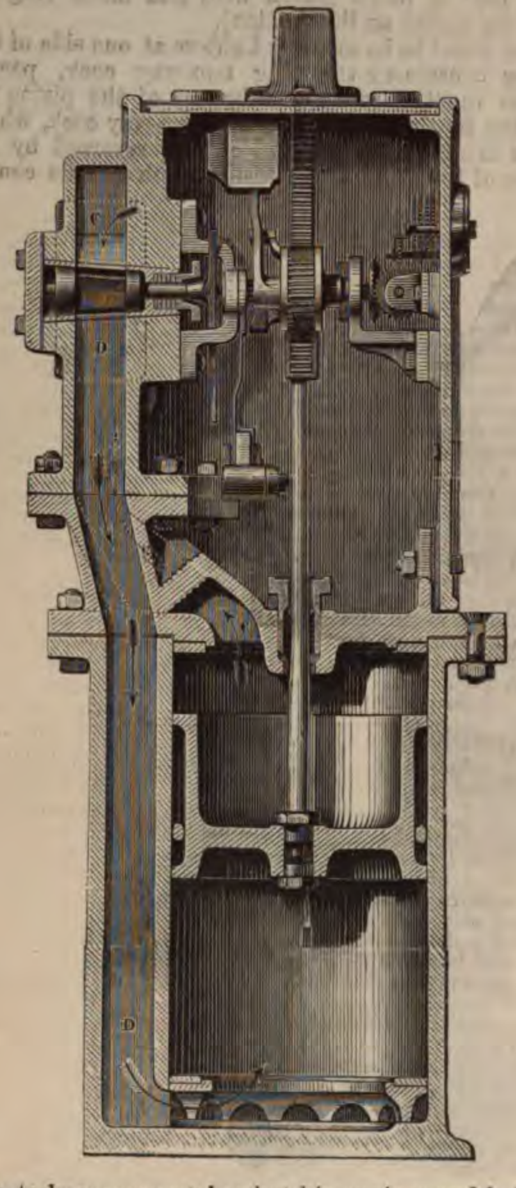
This frictionless working with exact water-tightness is obtained by great care and ingenuity of arrangement in all the operative parts. The only two stuffing boxes of the piston, and reversing valve are packed with packing dipped in melted hog's lard, tallow would be too stiff for cold water. The packing of the piston is by a solid indiarubber rolling ring which is free to roll in a recess of suitable length in the piston and the side thrust on the piston rack is taken on an antifriction roller. The reversing valve, which is practically a coned two-way cock, is reversed quickly and suddenly by the blow of an over-balancing weight or bob, so there is little dead drag on the piston.

When the meter is used for a temperature of water over 120° a metal piston with gun metal rings is used (as shown on illustration).

The water to be measured enters at one side of the casing containing the plug two-way cock, passes thence to either the top or bottom of the piston according to the position of the two-way cock, which latter is automatically and quickly reversed by the action of the piston itself lifting a bob over its centre of suspension, which then falls of its own weight, and reverses the two-way cock. The flow of water to the piston and its exit from the piston chamber is thus reversed, and the meter thus continues automatically to reverse the reciprocation of the piston, and to pass water continuously, the reciprocating rotation of the pinion shaft being transmitted as a continuous movement to the counting train of wheels and dials.

Tables of quantities deliverable by the various sized meters under different heads are given, with the easy rule that velocity of flow is directly proportional to the square root of the head, but it must always be remembered that any lengthy run of pipes, bends, elbows, cocks, or too small a diameter of main for flow desired will much reduce a theoretically calculated flow based on minimum resistance of pipes or passages.

We consider that no marine engineer who would wish to know accurately what his engines and boilers can do under varying circumstances should be without such a meter fitted to the feed-water supply.



H. E. MOSS & CO.'S STEAMSHIP CIRCULAR.

MESSRS. H. E. MOSS & Co. regret to say in their semi-annual Steam Ship Circular, the pessimistic views they have so persistently foreshadowed have been, unhappily, more than fulfilled, and the first half of 1896 may be chronicled as the worst period in the annals of steam shipping.

The anticipated increase in wages in the shipbuilding and engineering trades at the commencement of the year, together with the probable rise in the cost of raw materials and a slight spurt in freights, caused, as usual, a rush to order new boats and some of the yards were filled with new orders for tramps and liners. These orders have now been nearly worked off, and if steamship owners will only content themselves in replacing such boats as are absolutely necessary for old-established and existing lines, we may hope to see that improvement in freights for which we have been waiting so long.

It has been demonstrated beyond all measure that in long voyage trades it is only the newest and most modern type of steamer that can hold its own in the present days of excessive competition. The old and obsolete type of vessel must go to the wall, and for years past we have advised the realisation of such property. Large numbers have been sold to foreigners and others to be broken up, but many thousands of tons yet remain and must inevitably follow suite.

It is exercising the minds of many of our steamship owners as to whether the present existing rates of freights are to be considered the basis of the future. For our own part we do not think so. Granted rates are as low or lower than they have ever been, we believe they have touched bottom and will shortly improve.

The new features to be chronicled are the introduction of steam into the Californian trade; the wonderful energy of foreigners, especially of the Japanese, who are starting new lines of steamers, even to our own doors, in opposition to our old-established companies; the great strides made in Germany in the art of shipbuilding, where our naval architects have recently had the opportunity of seeing that work in the German yards can be well, efficiently, and cheaply executed, a fact which has already told, and is bound to tell more in the future, on our own shipbuilding industry. Although quadruple-expansion engines are being fitted in some boats now building, there is no marked inclination to adopt them generally.

A large number of useful second-hand steamers have been sold at very low prices to foreigners, principally for the Baltic and Black Sea trades, where they can be worked even now at a profit, free as they are from the excessive restrictions imposed on British shipping by over-zealous legislators.

Many new steamers are for sale in the hands of builders. There are also a number of nearly new triple boats that can be bought very cheaply. Prices for building new steamers are about 5 per cent. all round higher than in December last, but many builders being anxious for work would willingly forego their standing yard charges, consequently orders can be placed practically at nearly the same prices. How long this will last it is impossible to say, but as other trades are thriving, the railways prosperous, Board of Trade returns increasing, surely these factors must before long have a beneficial effect on the shipping industry, and place it on a sounder and more profitable foundation.

INSTITUTE OF MARINE ENGINEERS.

THE BRISTOL CHANNEL CENTRE.

DURING the recent visit of the North-East Coast Institution of Engineers and Shipbuilders to South Wales the programme arranged for each day was so extensive that it was deemed advisable to leave the evenings free. The one exception to this freedom was the occasion on which the members of the North-East Coast Institution were the guests of the Bristol Channel Centre of the Institute of Marine Engineers at a reception and grand smoking concert in the Park Hall, Cardiff. It was particularly appropriate that on the only evening so taken up the visitors should be entertained by the members of a kindred institution, and in honour of the occasion no efforts were spared by the members of the Bristol Channel Centre of the Institute of Marine Engineers in making the gathering a successful one. On the Wednesday evening the visitors accordingly assembled at the Park Hall, Cardiff, where they were received by the President of the Bristol Channel Centre (Professor A. C. Elliott, D.Sc.), the Mayor of Cardiff (Lord Windsor) and others. The hall had been tastefully decorated with draperies and shrubs, and presented a very attractive appearance. Besides the members of the two Institutions, the assemblage included the chief representative men of Cardiff and the district; the officers of the Naval, Regular and Auxiliary Forces were also present, and their bright uniforms were very effective in adding to the gayness of the scene. Professor A. C. Elliott, D.Sc. (President B.C.C. Institute of Marine Engineers) occupied the chair, and he was supported by Mr. Thos. Richardson, B.A., M.P., (President N.E.C. Institution of Engineers and Shipbuilders), The Right Hon. Lord Windsor (Mayor of Cardiff), Mr. John Gunn (President Cardiff Chamber of Commerce), Mr. Chas. A. Heywood (Chairman Reception Committee), Mr. W. R. Corfield (President Cardiff Incorporated Shipowners' Association), Mr. T. E. Watson, J.P. (President Newport Chamber of Commerce), Dr. J. Ll. Treharne, J.P., Mr. Alderman Trounce, J.P., Mr. Lewis Williams, J.P., Surgeon Lieut.-Col. Healey, Major Threshie and Captain Reade, The Barracks, Cardiff; Mr. Robt. Thompson, J.P. (Past President N.E.C.I.), Mr. J. R. Fothergill, Mr. J. F. Walliker, Mr. H. Macoll and Mr. J. Gravell (Vice-Presidents N.E.C.I.), Mr. Morel, J.P., Mr. Henry Heywood, J.P., Mr. Councillor David, Mr. H. J. Simpson, Mr. Cory, J.P., Mr. Alderman Carey, J.P., Mr. David Gibson (Vice-President B.C.C.), Members of Committee B.C.C.—Messrs. J. Chellew, Robt. Davison, Jas. Ferrier, J. McCallum, W. Simpson and A. E. Smithson; Representative to Council—Mr. D. McCallum; Honorary Treasurer, B.C.C. Institute Marine Engineers, Mr Chas. L. Ryder; Honorary Secretary, B.C.C. Institute Marine Engineers, Mr. George Sloggett; Mr. A. Rickaby, Mr. J. Reavell, Colonel Bingham (Sheffield), Mr. H. H. Wake (Engineer Wear Commissioners), Mr. George Rutherford, Mr. T. W. Wailes, Mr. M. W. Aisbitt, Mr. J. Duckitt (Secretary N.E.C. Institution), Mr. G. A. Macarthy, Mr. S. W. Allen, Mr. J. Nodder (Sheffield), Capt. T. H. Sloggett, Mr. Edward Lewis, Lieut. W. H. D. Caple, Lieut. H. C. Newman, Mr. C. F. Gooch, J.P., Mr. A. K. Hamilton, Mr. J. G. G. Rule, Mr. F. R. Noton, Mr. A. F. H. Bancroft, Mr. C. Taylor, Mr. J. H. Riley, Mr. W. G. Reynolds, Mr. W. Sibun, Mr. H. Fownes, Mr. N. Hirst, Mr. W. Swinney, Mr. E. B. Reece (District Coroner), Mr. W. Rosser, Mr. John Spence (Tyneside Engine Works), Mr. Henry Radcliffe, Mr. Marcus Gunn, Mr. Chas. Thompson (Sunderland), Mr. L. G. Laurie, Mr. John Boddy, Mr. Edgar, Capt. Parfitt (Dockmaster, Newport), Mr. Mordey, Mr. Carney, Mr. Stephen, Mr. C. H. Bailey, Mr. Evans, Mr. Ferrier, Mr. Jackson, Mr. Scott, Mr. Symonds, Mr. S. F. Walker, Mr. J. M. Campbell, Capt. W. Cassap, Mr. A. MacGlashin, Mr. J. Barclay, Mr. J. Hogg, Mr. W. Evans, Mr. G. E. Macarthy, Councillors Waring, Andrews, Hughes, Munn, Dr. T. Wallace, J.P., Dr. Macormack, Major W. E. Jones, Major Rigg, Surgeon Capt. Tatham Thompson, Col. E. C. Fry, Mr. Lewis Turnbull, Capt. C. E. Stallybrass, Lieut. A. E. Evans, R.N.R., Capt. John Traill, Lieut. Hoyle, Capt. Rosser (Dockmaster, Cardiff), and others. The proceedings commenced with the National Anthem on the grand organ.

The Chairman, Professor Elliott, then said that he rose for the purpose of addressing a few words of welcome to the members of the North-East Coast Institution of Engineers and Shipbuilders, in the name of the nearly kindred society, the Institute of Marine Engineers. Their Institute had many habitations, and Cardiff claimed one of those habitations. They were, of course, anxious to extend the number of habitations, but they had never been able to found a centre in the North of England, because the ground was already occupied by the North-East Coast Institution of Engineers and Shipbuilders. He did not say that in any spirit of rivalry: all engineers were rivals—rivals in the art of doing well. Even the members of the Society, if the Society were any good, were rivals one with another. The North-East Coast Institution of Engineers and Shipbuilders had done a noble work. It had published proceedings that were of great and permanent value. Some Institutes had surpluses, some had spent them in eating and drinking, and others had hoarded them. Some, like the Institution of Mechanical Engineers, had nobly spent them in research for the benefit of the profession at large. But amongst those Institutions, the North-East Coast Institution had taken a distinct line. It had provided somewhat for the future, for the youths to whom the profession of the future was to be committed. It had founded the profession of Engineering in the Durham University and supported it to a great extent as well. They, as engineers, were happy and proud to welcome the Institution. They were happy to welcome them because they knew that they (the visitors) were jolly good fellows, and they were proud to welcome them because they were proud of Cardiff. They knew that in Cardiff they could show them some things that must rejoice the heart of the mechanical engineer in whatever department he might have been trained, and in whatever department his life's business might be cast. Amongst other things, they were proud of their noble Mayor and proud to witness his sympathy and deep interest in the commercial and industrial affairs of this great and rich country of South Wales. Before he concluded, he must refer to the past president. The name of Richardson was well known, and in Cardiff it did not require any introduction.

The Mayor of Cardiff (Lord Windsor) said their chairman had been kind enough to ask him to associate himself with the words of welcome that he had just addressed to the members of the North-East Coast Institution of Engineers and Shipbuilders. He considered it a privilege to be allowed, on behalf of the Corporation and inhabitants of Cardiff to add just two or three words of welcome. They prided themselves, in Cardiff at least, in throwing their hearts into everything that they did. On that occasion they hoped they were throwing their hearts into the welcome they were giving to the Institution. They were gratified that they should have selected Cardiff that year to inspect what they had to show them, and, he hoped, to instruct them (Cardiffians) a little bit too, and he sincerely trusted that they would pass a pleasant week, and that they would go away from South Wales and from Cardiff feeling that the people living there were anxious to make the best of their position, to make the best of their wealth and resources, but who felt that they could not do without the intelligence that might be brought into their midst from other parts of the country.

Mr. Thos. Richardson, B.A., M.P., in replying on behalf of the Institution to the welcome extended to its members, said it was very gratifying to him in coming to a town of such very great importance as Cardiff, to hear on all hands with what conspicuous ability and energy their worthy Mayor fulfilled the duties that fell upon him. They had been invited there that evening by the Bristol Channel Centre of the Institute of Marine Engineers, an institution which had a world-wide reputation second in importance to none in the country. Professor Elliott, in his remarks, paid the North-East Coast Institution a very high compliment. He said they did not possess a branch of the Institute of the Marine Engineers on the North-East Coast because the ground was fully covered by their Institution. He thought they would all agree with him that such an important institution as the Marine Engineers, if they had a meeting in the North, would find that they would possess a great many of their members there. Professor Elliott had remarked that such an institution composed of members who were at different times in every part of the world, found it difficult to have any local habitation, but he thought that when they had their headquarters in London, and possessed such a large number of members, it was a sufficient index of the prosperity of that Institution. He was particularly pleased to be there that night, because he had some little time ago an invitation to one of their Bristol Channel Centre celebrations which, unfortunately, he was unable to accept, but he had the pleasure of meeting Professor Elliott only last week at the anniversary dinner of their Institution in London. The chairman had referred in the course of his remarks to the fact that the engineers required some representation in the House of Commons. Well, they had had some representation there for a good many years, but he was pleased to think that at the present moment they had no less than 14 representatives in the House of Commons, who had, as it were, started life with the hammer and chisel. He thought that Professor Elliott would bear him out, that there was need of representation on behalf of the engineers in the House of Commons. One of the gallant Admirals of our Fleet who was in the House, referred to the engineering members in the House of Commons, and—he forgot exactly the remark he made, but it would bear this interpretation—that they placed too much importance upon that branch of the service in the Navy. (A voice: "Not at all.") He thought anyone who was present at that dinner would be quite willing to echo that sentiment. The gallant Admiral went on to say that what they wanted to recognise was, that they were all one, and that they ought to think more of the word *we*. Well, that was exactly what they thought, and, as he said then, what they objected to was the *we* being retained with a big *W* for the executive, and a small *e* for the engineers. They wanted to see a capital *E* as well as a capital *W*. He had no doubt that in course of time they would bring the Admiralty Board to see that some greater recognition should be taken of the services of the engineers in the Fleet. He could assure them all in the room that the invitation which they accepted to come there [illegible] expectation of enjoyment that they formed had be exceeded. They had no doubt that in coming to a town like Cardiff, whose growth was one of the miracles of the age, that they would be heartily welcomed. It was not a town that had suddenly risen into importance. If they went back into the pages of history they would always find that Cardiff was a town of importance. After again thanking the Bristol Channel Centre for their effusive welcome the hon. member resumed his seat amid cheers.

An admirable musical programme, under the able directorship of Mr. A. E. Smithson, was then carried out. The organ solos "Menuet Régence," by Bachmann, and "Andante in A," by Batiste, were delightfully rendered by Mr. J. E. Deacon. The Caerphilly Male Voice Choir, under the conductorship of Mr. S. E. Evans, gave some excellent examples of Welsh chorus singing, and received well-merited praise. The song of Miss Beatrice Edwards, "For all Eternity," and its violin obligato, played by Mr. Lane Herbert, was greeted with tremendous applause. The subsequent efforts of Miss Edwards were equally appreciated, as were those also of Miss Dot Prosser. The playing of Mr. Lane Herbert was very effective in his violin solos, "Cavatina" and "Tarentelle." Mr. J. F. Coughlin gave a capital clarionet solo. The inimitable Mr. Bert Lewis, who is so well known to Bristol Channel audiences, surpassed himself, if possible, on this occasion; "I ain't a going to tell," and other songs sung by him were all extremely entertaining to his audience. Inkey and Oakey (Messrs. Thistlewaite and Williams), the humourists, and Mr. Elliott were all very clever in their various characters. "I'll sing thee Songs of Araby" and "The Last Watch," were most charmingly rendered by Mr. E. T. Haddon. "The Skipper," sung by Mr. Norton Deane, and "The Outpost's Vigil," by Mr. S. R. Ham, both evoked much applause. Mr. Sam Allen, in his humorous representation of "Our Village Penny Reading," was exceedingly good, and the audience insisted on his recall; Mr. Allen responded with a recitation. The duet, "Army and Navy," by Messrs. R. J. Williams and A. J. Parsons, was most successful. As an accompanist Mr. F. Jones acted admirably. Mr. J. E. Deacon's organ and pianoforte selections were a very attractive and favourite part of the evening's entertainment. A vote of thanks to the chairman was proposed by Mr. J. R. Fothergill, to which Dr. Elliott replied. The very enjoyable evening terminated by the whole audience joining with the organ accompaniment in singing "God save the Queen."

DEVELOPMENT IN DESIGN AND CONSTRUCTION OF GERMAN MEN-OF-WAR.[*]

By Herr A. Dietrich, Wirklicher Geheimer Admiralitätsrath, Constructor in Chief of the Imperial German Navy; Member.

THIRTY years ago only one shipyard in Germany was able to construct men-of-war adequate to the demands of the time, the Royal Prussian Dockyard at Danzig. At that time this yard was building the wooden screw frigate *Elizabeth*, and a short time later two ships for the newly-formed North German Confederation, the *Undine*, a sailing brig for training purposes, and the armoured screw corvette *Hansa* of 3,600 tons displacement; the last one was the first ironclad vessel ever built in Germany. The Dockyard at Danzig was fitted out to build only wooden hulls, so the iron unarmoured superstructures of this ship were built up by the Vulcan private dockyard at Stettin, the armour plates were ordered from England. In the year 1869 the first *iron* armour-clad ever built in Germany, the turret-ship *Grosser Kurfürst*, was commenced in Wilhelmshaven, where the new dockyard was not even nearly finished. The shipyard Vulcan in Stettin started shortly afterwards on the *Preussen*, a sister vessel of the *Grosser Kurfurst*. Work on these vessels could only be carried on very slowly during the time of the Franco-German war, so that the first *iron* armour-clad built in Germany, the *Preussen*, could not be launched before November, 1873. Her sister ship, the *Friedrich der Grosse*, was launched in 1874 from the new Imperial Dockyard at Kiel. Owing to the unfinished state of the dockyard at Wilhelmshaven, and the very unfavourable conditions, the *Grosser Kurfürst* was not ready for launch before September, 1875, six years after work was commenced.

After the Franco-German war the Chief of the German Admiralty, General von Stosch, laid out a plan to build up the navy (Flottergründungsplan), according to which work was commenced, but is not quite finished at present, as not all types of ships have the intended number of vessels.

To get armour-clads as quickly as possible, it was necessary to place orders abroad, since German shipyards were not efficient enough at that time. The two armoured frigates, *Kaiser* and *Deutschland*, were built at Samuda's Dockyard from the designs of Sir Edward Reed, and were launched in the year 1874. These two ships still form part of the German battle fleet, after having been reconstructed, as well as it was possible, to suit modern requirements.

Since that time no German man-of-war of any considerable size has been built abroad, the German shipyards were in the meantime well fitted to execute all orders. Then those vessels were commenced which suited best the formation of the German coast. According to the building plan, four coast-defence armour-clads (Ausfall-Corvetten) of the *Sachsen* type were ordered, which, on a draught not exceeding 6 m. (19·68 ft.), had to carry the heaviest armour of 16 in. thickness (Sandwich system), and an armament of six guns of 26 cm. (10 in.) calibre. These ships are nearly the first armour-clads ever constructed on the citadel type. The keel of the *Sachsen* was laid as early as 1874, and she was launched in 1877; the first citadel ships, the *Inflexible* and the *Duilio* were launched in 1876. The last of the three sister ships of the *Sachsen* type, the *Baden*, was not launched till 1880.

Coast defence had to be considered before anything else, and, therefore, contemporaneously with the above-mentioned vessels, work was commenced, not on monitors as at first planned, but on ironclad gunboats of the *Wespe* type. These boats, of 1,000 tons displacement, were plated with 8 in. (200 mm.) armour, carried one gun of 12 in. (30·5 cm.) calibre, and drew only 3 m. (9·84 ft.). Eleven of these boats were built.

For a long time no armour-clad was built in Germany except the *Oldenburg*, which was started in March, 1883, and finished in November, 1886. She was intended to be the fifth vessel of the *Sachsen* type; but, owing to want of money, she had to be made smaller and of quite another type.

With the armour-clad *Siegfried* a quite new type was started in 1887, also intended for coast defence only, and especially for the mouth of the river Elbe, on account of the construction of the Kaiser Wilhelm Canal.

Eight vessels of this type were built, but the two last, the *Aegir* and *Odin*, are somewhat different from the sister ships, being constructed after the citadel type ships. The main condition for these vessels also is the low draught, only 5·5 m. (18 ft.). They carry, on a displacement of 3,500 tons, heavy ordnance, three 24 cm. guns, arranged especially for defending river estuaries, and are armoured with 240 mm. (9 7-16ths in.) plates, and have a speed of 15 knots.

Thus, since 1873, three different types of armour-clads, of 7,400 tons, 3,500 tons, and 1,000 tons, were built for coast defence, each type designed and executed for this limited purpose.

The construction of seagoing armour-clad battleships, which have to advance farther out, in order to defend the coasts more effectually, was not commenced before 1889, after a lapse of sixteen years. Then, however, four vessels of the same design were started simultaneously; these are the *Brandenburg*, *Weissenburg*, *Worth*, and *Kurfurst Friedrich Wilhelm*, of more than 10,000 tons displacement, a speed of 17 knots, 400 mm. (15·75 in.) thickness of armour in the belt which surrounds the water-line, and, in addition to a reduced light armament, six guns of 28 cm. (11 in.) calibre in three revolving turrets.

Two still bigger ships, the *Ersatz-Preussen* and *Ersatz-Friedrich der Grosse* (to replace the before-mentioned ships), whose principal dimensions were materially affected and restricted by the small size of the existing German dry docks, are being built now at the Imperial Dockyard at Wilhelmshaven.

The development of the unarmoured ships was strongly influenced by closely adhering to and imitating the types of screw frigates and corvettes existing in the year 1871 in the German Navy, the type of the full-rigged single screw frigates and corvettes with broadside guns without any armour protection. The vessels had full sailing capacity, and great stress was laid on the training of the crew in the rigging, but the fighting capacity of the vessels was neglected. Such vessels were constructed even as late as 1887 (*Charlotte*, *Arcona*, *Alexandrine*).

Cruisers to suit modern requirements were not commenced before 1885. Three of those vessels of the second-class have been built up to now, the *Irene*, *Princess Wilhelm*, and the *Kaiserin Augusta*; the last of which is the first triple-screw ship which crossed the Atlantic. Up to 1895 only one moderately armed and protected cruiser of the third-class (*Gefion*) was built, together with a number of smaller cruisers of the fourth-class (*Bussard* type).

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[*] Read at the Summer Meeting of the Thirty-seventh Session of the Institution of Naval Architects.

By this time the want of cruisers was felt so severely that three second-class cruisers of more than 5,600 tons (*Ersatz-Freya*, *K* and *L*) and one first-class armoured cruiser of 10,650 tons (*Ersatz Leipzig*) were commenced. To these vessels were added this year two more cruisers of the second-class (*M* and *N*).

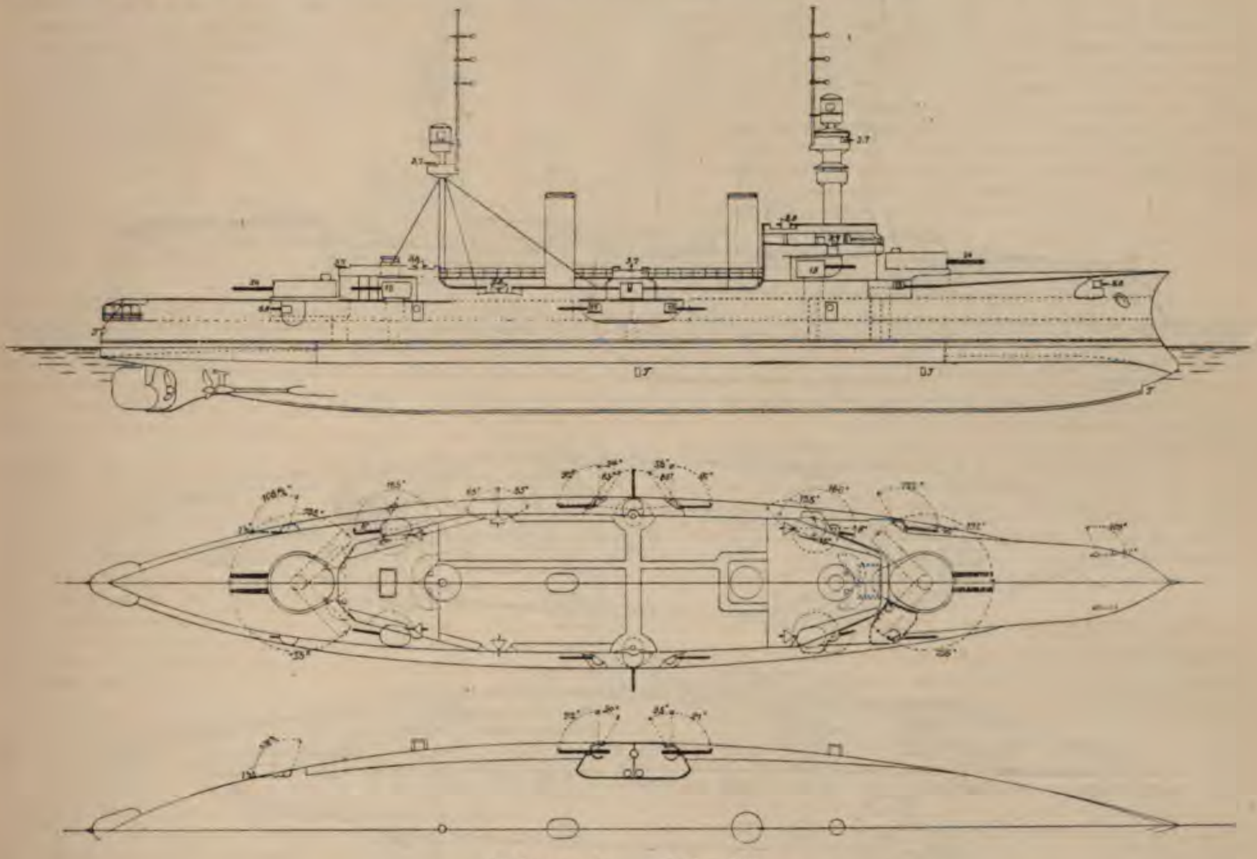
A special feature in the German Navy has always been the "avisos," speedy vessels of small fighting capacity, designed only to serve as scouts for the fleet. But soon these vessels were required to fight, especially after the introduction of the torpedo; in consequence, the vital parts had to be protected. Out of the last German vessel of any size built abroad, by the Thames Ironworks, 1875-76, viz., the *Zieten*, the modern German "avisos" were developed. These were first of all the *Blitz* and *Pfeil* with underwater torpedo armament and of 16 knots speed, forerunners of the later-built English boats, *Surprise* and *Alacrity*. The *Greif*, of 19 knots speed, succeeded in 1885, and was followed by the *Wacht* and *Jagd*, of 19½ knots speed, and fitted with a protective deck.

After these come two small "avisos" of the same speed, the *Meteor* and *Comet*, of 1,000 tons, and then the aviso *Hohenzollern*, a splendid vessel fitted out as an Imperial yacht, with 21·5 knots speed, of about 4,000 tons displacement. The last of the avisos is the *Hela*, of 2,000 tons displacement, now beginning her trials.

I will pass over the torpedo division boats and torpedo boats, even though the development of these craft in Germany is very interesting.

This short review, perhaps, shows some of the difficulties which had to be dealt with to build up the Navy. But now the strong influence of His Majesty the Emperor, supported by the great efficiency of the German shipyards, and steel works, and all those other trades which help to finish a modern man-of-war, opened up the way for the new development.

In the years after 1870, as the material was needed for the naval vessels to be built in Germany, ironworks had first to prepare to fulfil the orders for material of the same quality as was required by the English rules, which were adhered to. Plates and angles were soon produced, just of the same good quality as in England; but it was difficult to forge heavy pieces, like stems, sternposts, and rudder-frames for bigger ships, and for several years these had to be ordered from England. To-day in this respect, too, German works are equal to any demand; the stem and sternpost, with rudder-frame, of one of the armourclads of the *Brandenburg* type made by Krupp was much admired at the Exhibition in Chicago.



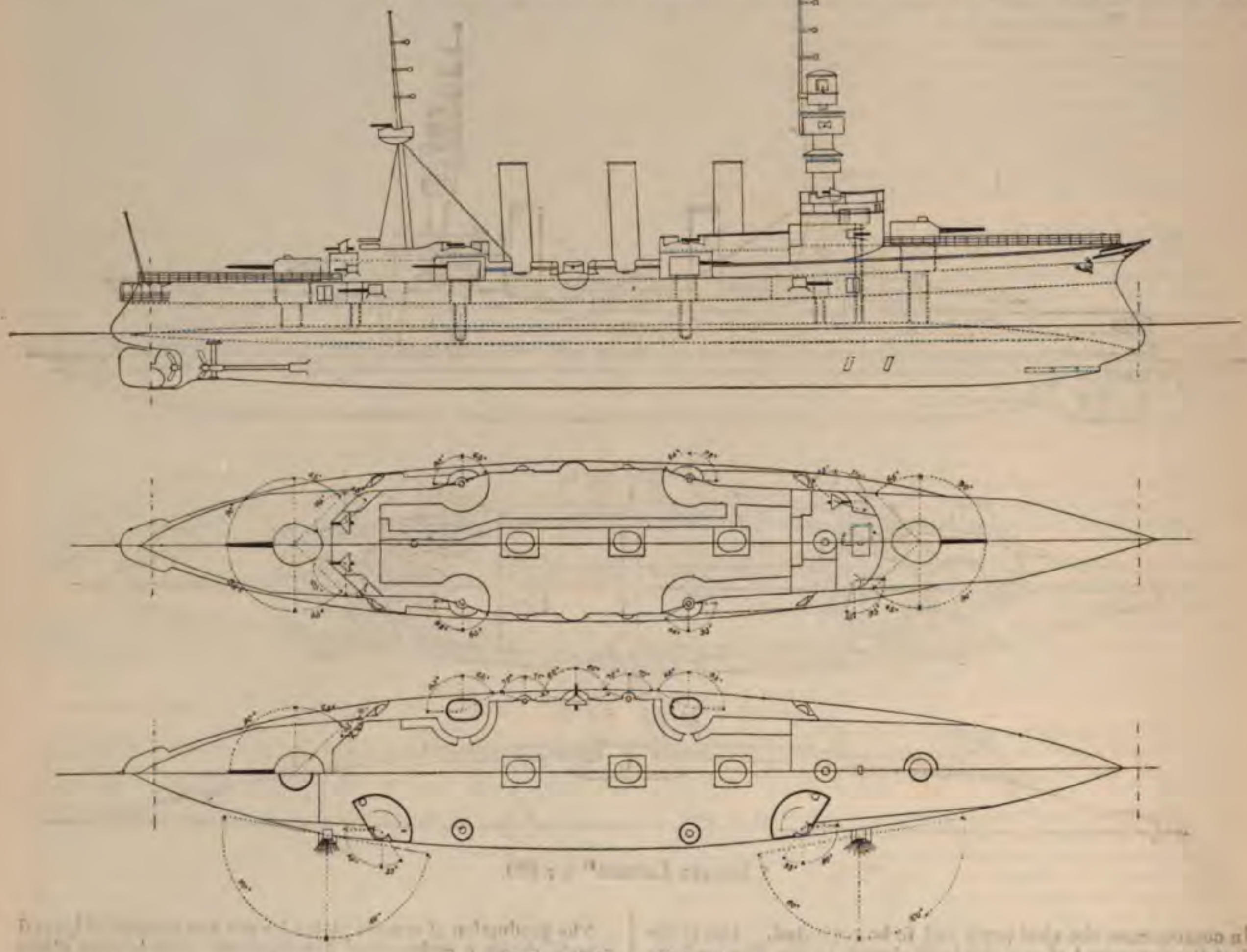
"Ersatz Leipzig" 1 : 500.

The production of armour plates for our armour-clad ships and vessels shows a rather slow development. The armour plates were first ordered in England from Charles Cammel & Co. and John Brown & Co., both in Sheffield. In 1876 the Dillinger Works on the Saar made preparations to produce iron armour, and furnished, first, the 203 mm. (8 in.) plates for a number of armoured gunboats of the *Wespe* class, afterwards plates of 254 mm. and 305 mm. (10 in. and 12 in.) thick for two ships of the *Sachsen* type (the *Baden* and *Wurttemberg*), and in 1879-80 plates 305 mm. (12 in.) thick for the reconstruction of the *Konig Wilhelm*.

In 1880 the Dillinger works obtained the English "Wilson" patent for producing steel-faced armour plates (compound armour), and furnished those plates, first for the *Oldenburg*, and thereafter for all armour-plated German ships, until, in 1890, steel-faced plates were superseded by nickel armour plates, which are also produced by the Dillinger works.

Since 1891 the works of Krupp, in Essen, also have made great preparations to manufacture armour plates. These two factories now work together, and not only can turn out all the armour plates needed in Germany, but execute foreign orders also. The latest face-hardened armour plates of these two works are perhaps the best plates produced anywhere. Germany has become perfectly independent in this respect also.

England has been Germany's teacher in the construction of hulls, engines, and boilers. Those ships which were brought from and built in England for the German Navy had to serve as standards from which to imitate the details. Our inspectors kept their eyes and ears open, and the many publications, as, for instance, Sir Edward Reed's and Sir William White's precious works, the Transactions of the Institution of Naval Architects, the instructive articles in the periodicals, *Engineer* and *Engineering*, offered an abundance of information to those who intended to learn, like the Germans of that time. The engines of the screw frigate *Elizabeth* had to be ordered, in 1867, from England (Maudslay), because they could not be designed and built in Germany. The first large screw engines for Navy ships were constructed in 1871 and in the following years at the works of Egells, in Berlin, for the corvettes *Ariadne* and *Luise*, and at the Vulcan Works in Stettin, in 1874 for the armour-clad *Hansa*. These engines were of English model in general design, and entirely so in all details.



"Ersatz Freya," 1 : 500.

But since that time German industry has made such progress in the building of large marine engines that it now comes up to the highest standard, and has grown to be wholly independent. Already, nearly twenty years ago, German manufacturers went their own way in working out the plans and the details of engines and boilers, taking advantage of all the new inventions in England and France.

To-day the construction of navy vessels in Germany is worked out from original ideas, in order to fulfil the military requirements for each type. The new German men-of-war now in course of construction will, in many respects, be worthy of interest, since all modern improvements in science and technical knowledge have been taken advantage of to produce a most perfect tool for any war purpose.

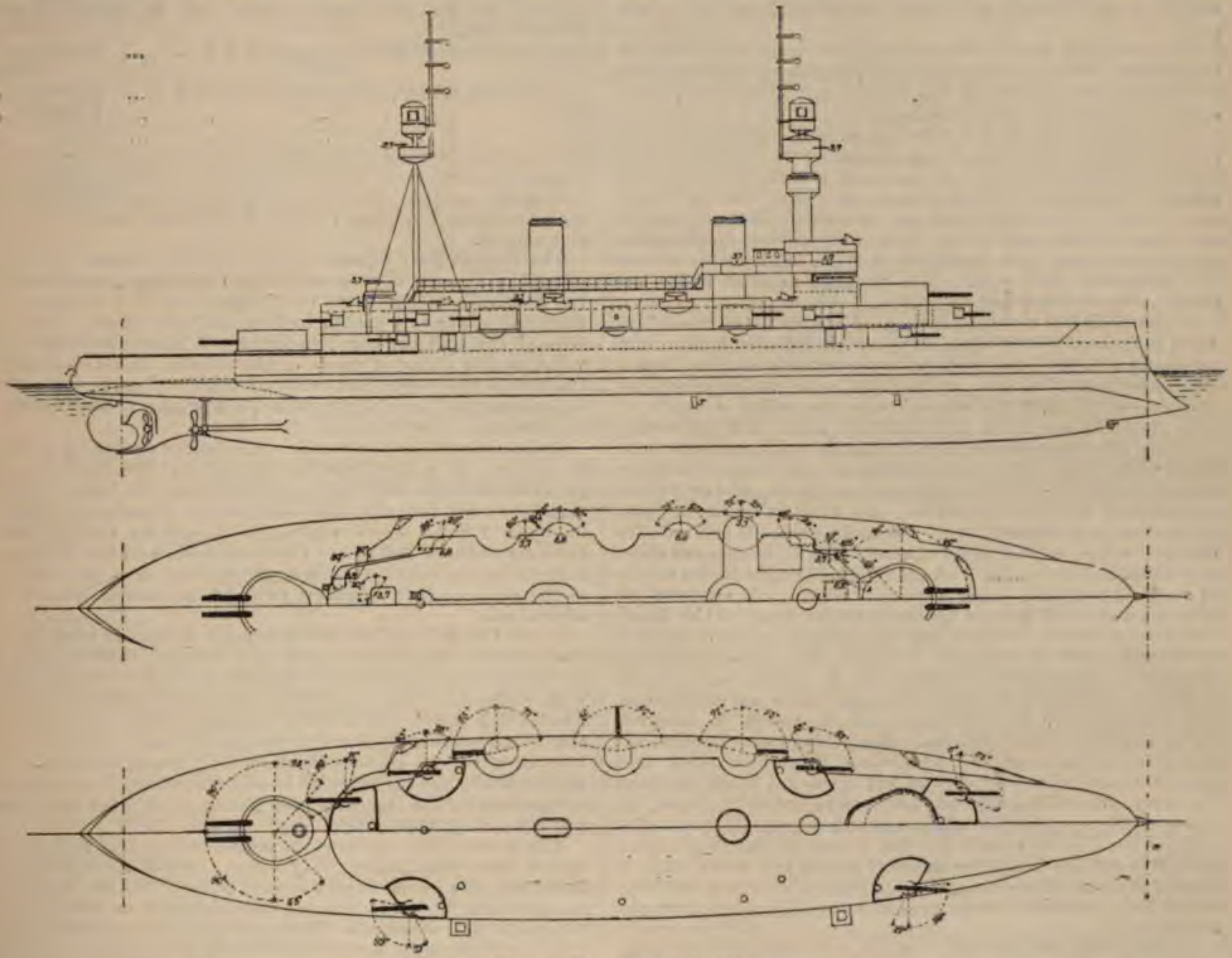
I shall describe now, in a very few words, some arrangements in which German men-of-war, in my opinion, differ from the English-built warships. I mention here, first of all, the divisions into watertight compartments.

The armour-clads, armoured cruisers, and protected cruisers are divided into as many watertight compartments as it was deemed possible without interfering with the working of the vessel. Perhaps this is carried out already too far, and the service on board may be obstructed. The paper by Lord Charles Beresford, read before the meeting of the Institution in March of this year, mentions those considerations which prompted the constructor here to carry every athwartship-bulkhead above the waterline, without any door in it. Any door may be left open, therefore, one has to accept the probability that it will be left open, and, consequently, it is better to have no door at all. Communication from one engine-room to the other, from one stokehold to the other, must be established only over the protective deck, above water, or may be carried on below by telegraphs and speaking-tubes.

Only in the athwartship bulkheads which are beneath the protective underwater deck of citadel ships, or in the foremost and aftermost parts of protected cruisers, doors are permitted. This circumstance speaks strongly against the construction of such vessels.

The above-mentioned principle is strictly adhered to in all new German Navy vessels.

It is difficult to ventilate a ship divided in this way. Air from above must directly lead into, and out of, each compartment between two athwartship bulkheads, which has direct access from above. Only for the forward and aft compartments underneath the protective underwater decks air ducts are carried through the athwartship bulkheads, and watertight shutters have to be provided for, which are perhaps insufficient, but have to be made use of in vessels of the citadel type.



"Ersatz Preussen," 1 : 500.

Modern vessels suffer a great deal from the heat which radiates from the steam piping belonging to the large number of auxiliary engines installed in all parts of the ship, and which supplies the ship with continuous steam heating. All attempts of engineers to cover these pipes with non-conducting materials, and to insulate them so as to prevent this radiating heat, have entirely failed, and every room through which a steam pipe is carried is heated very disagreeably. The best method of counteracting these effects of steam-engines and steam pipes was found to be by omitting them, and by employing electricity, the conducting wire taking the place of the steam pipe. Only by driving the many fans made necessary for the watertight compartments by electricity is the division into so many compartments rendered at all possible.

All new German warships in course of construction have electricity as motive power, not only for those ventilating fans, but also for the turning gear of the 15 mc. gun turrets, for ammunition hoists, for boat-hoisting, and coaling winches and suchlike gear.

For the turning gear and ammunition lifts of the heavy guns hydraulic power has been retained, and steam is still used for the steering gear where it was especially difficult to install the electric motor as well as for the anchor windlasses, which are only comparatively seldom used. Only one vessel in the German Navy, the nearly finished *Aegir*, is experimentally fitted throughout with electric appliances, even for steering gear and windlasses. The result of these experimental installations will decide if, in the future, electricity can be used more extensively for motive power on board ships and if the heat sources can be further dispensed with.

His Majesty's cruiser *Kaiserin Augusta*, of 6,300 tons displacement, over 13,000 I.H.P., and with a speed, at lead draught, of over 21½ knots, is the first German vessel with three screw propellers; she is also the first triple-screw steamer which ever crossed the Atlantic. [In 1893, in order to be present at the celebration of the four hundred years jubilee of the discovery of America.] It is hardly necessary to discuss at any length the considerations which caused the adoption of a system accepted already some time before in Italy for the *Tripoli*, and decided on in France for the *Dupuy de Lome*.

By dividing the excessive motive power of the modern warships into three parts, the smaller engines could be more easily constructed, and, as they do not stand so high, it is less difficult to place the vertical engines underneath the

In a combat additional security of

pared with the twin-screw ships, and, lastly, saving of fuel should result in using only one of the smaller engines when cruising at reduced speed.

Although the engine-room staff has to be augmented, greater engine space is required, and the three engines themselves are to a small extent heavier, these disadvantages were not considered important enough to outweigh the advantages of the triple-screw for all battleships, and for the first and second class cruisers in the German Navy. Triple-screws are provided for the new battleships *Ersatz-Preussen* and *Ersatz-Friedrich der Grosse*, the armoured cruiser *Ersatz-Leipzig*, and the second-class cruisers *Ersatz-Freya K, L, M*, and *N*.

In all the new ships the armament, and its protection, in accordance with the latest experience, require so much of the weight which makes up the displacement, that somewhere else weight had to be saved, which would be available for armour and guns.

Nowhere could weight be reduced, since more was asked for everywhere. Though, to facilitate work, more auxiliary machinery is installed, the number of the crew is not diminished; these engines require even more attendants.

The weight of the hull is, through rational construction and reduction of the scantlings, lessened as much as the strains will permit, in some cases even in excess of a sufficient margin of safety. Considerable reduction in the weight of the ship's hulls was effected by the restricted use of wood. The splinters of wood scattered by penetrating shells were always dreaded, the experiences drawn from the battle at Yalu have clearly shown how dangerous such combustible material as wood is for the construction of a ship and its fittings.

In the outfit and the construction of the new German ships wood is used only for a few minor parts. Wooden deck planks are no longer laid, steel deck plating is covered with linoleum, sometimes over a layer of cork. In the crews' quarters the sides of the ship are not ceiled, in the officers' rooms the ceiling is made of steel plates, 1½ mm. thick, and lined with cork. For cabin bulkheads the steel is covered with thin woollen cloth, and with cork lining underneath, where it is desirable to exclude sound or lower the temperature. Where heat is radiated from engine or funnel casings cork lining is resorted to. All wood is removed from the ammunition rooms, save the racks for shells and powder charges, which are still made of wood. For all ladders and steps steel is used. The handrails on the conning bridges are no longer of wood, but of some other material which will not burn or splinter, and which is more agreeable to the touch of the hand than steel or brass. Chart-houses and captains' rooms on bridges are entirely made of steel, and fitted out with non-combustible materials. Since all such changes will be a little exaggerated it seemed to be advisable to abandon wood for the interior fittings, and especially for the furniture, and to resort to fireproof material which will not splinter. Many things were tried, furniture was made of steel and aluminium, lined with cork, and covered with linoleum or canvas, but it was not equal to wood furniture. Only the bedsteads are constructed of iron, steel, or brass, which materials are also much in use ashore. The insignificant quantity of wood in the few pieces of furniture when ignited is not the dangerous source of smoke, but much more is the outfit of the state-rooms, the mattresses, blankets, clothing, books, &c. Therefore for the present wood cannot be abandoned entirely.

Top and signal masts, flag-poles, &c., will be made of steel, but there one cannot save weight.

The fighting capacity of the ships is without doubt increased through these innovations, since the ship is less apt to burn; the effects of splinters are restricted, and considerable weight is saved, which is available for ordnance and armour.

But still greater reductions were needed, and though the power of the engines had to be raised their weight had to be kept as low as possible.

In the engine department the condenser plant is now exceedingly complicated, also the boilers are at present very heavy in consequence of the high pressure used. Boiler feed water, which was formerly not needed, has to be carried, and the weight of machinery has increased above that of the old engines with low pressure when the boilers were fed with sea-water.

Granted the modern engines consume less coal, might it not be better to save weight with a less complicated engine and carry more coal? I only refer here to engines of war vessels where quite other conditions prevail than in the Mercantile Marine, where the vessels always go at full power, while the man-of-war very seldom utilises the full power of her engines and boilers.

This is a chapter by itself worth the investigations of a specialist, who could thoroughly clear up this question, but it is outside the scope of this paper.

The engine weights could not be reduced, so one had to look for reduction to the boilers, which represent such a considerable weight. Here a reduction could be had by adopting the water-tube boiler. This problem of the water-tube boiler is one of the most important and difficult ones in modern marine engineering, and is very actively discussed in the English, French, and German Navies. Subsequently to the French and English Navies, the German has also taken decided steps, accepting water-tube boilers for many vessels.

Not less than four different kinds of water-tube boilers are adopted for the new German ships now in course of construction, viz.:—

Aegir, armour-clad fourth-class, 4,800 I.H.P. ...	Thornycroft boilers
Ersatz-Freya, cruiser, second-class, 9,000 I.H.P....	Niclausse ,,
K, ,, ,, ,, ...	Belleville ,,
L, ,, ,, ,, ...	Dürr ,,

The two armour-clads of the first-class, as well as the armoured cruiser, *Ersatz-Leipzig*, will be fitted with two-thirds cylindrical boilers and one-third water-tube boilers of the system which will be found best from the results of the trial trips soon to be commenced.

The English Navy seems to prefer Belleville boilers for bigger ships, the French Navy provides for these ships, together with the Belleville boiler, those of D'Allest and of Niclausse; the Dürr boilers are very similar to those last mentioned. The trial trips of this and the next two years will show more clearly the value of the different types of the boilers. All the so-called theoretical discussions and contentions are useless, only practical experience can decide this question, but years may lapse before it is settled.

In the future the use of water-tube boilers cannot be avoided in Navies. By fitting them for one-third of the engine power (13,000 I.H.P.), in first-class ironclads about 140 tons of weight are saved; and the reduction of weight for second-class cruisers of 9,000 I.H.P., where water-tube boilers are entirely used, amounts to about 280 tons. The combined working of water-tube and cylindrical boilers was the subject of a paper at the meetings of the Institution last year, but no decided opinion was arrived at.

In the Dutch Navy, too, the combined system is adopted for the three new large cruisers, but in a different form to ours, as the Dutch intend to generate two-thirds of the engine power with water-tube boilers, and one-third with cylindrical boilers. The leading idea in the German arrangement is that, as a rule, the vessel steams at reduced speed, and uses only one set of cylindrical boilers, keeping the other free for easy cleaning. The water-tube boilers are provided in order to get up, in the shortest time, steam for the highest engine power, at all other times fires are drawn from those boilers.

The greater coal consumption seems to be a drawback to the use of water-tube boilers; only actual trials of ships in service will decide the merits of each type of boiler. In the meantime we are in the dark. It is at any rate hazardous to proceed with the use of the water-tube boilers, so long as we have only the experience acquired in the French Navy and nowhere else; but the increased fighting power demanded, which cannot be provided otherwise, forces us to such action.

What an engineer of note wrote a short time ago in the *Daily News* is certainly correct, viz., "In the next war the side which has the best boilers will win."

Some more characteristic features of German ships of war could be brought forward; for instance, the fact that the protective underwater deck is never cut through for ventilating or coaling purposes; then the peculiar construction of the cork-filled coffer-dams; the singular shape of the stern and rudder; the very high bow and low stern; but it would take too much time to thoroughly deal with them.

The annexed table and three sheets of sketches contain the particulars of the German men-of-war of the latest type.

I trust, though this paper is necessarily very incomplete on account of the very short time available for its preparation, the Institution will perceive from it how hard we had to work here in Germany to call into existence a Navy in the short space of a quarter of a century; how we had to study and to test in order to

DETAILS AS TO GERMAN WARSHIPS IN COURSE OF CONSTRUCTION, 1896.

Class of Ship.	1st Class Battleship.	1st Class Cruiser.	2nd Class Cruiser.	2nd Class Cruiser.	2nd Class Cruiser.
Name.	*Ersatz-Preussen.*	*Ersatz-Leipzig.*	*Ersatz-Freya.*	K.	L.
By whom designed	A. Dietrich, Constructor-in-Chief.	As before.	As before.	As before.	As before.
When and where laid down	Imp. Dockyard, Wilhelmshaven, March, 1895.	Imperial Dockyard, Kiel, Autumn, 1895.	Imp. Dockyard, Danzig, October, 1895.	Vulcan Works Stettin.	Weser Works, Bremen.
Date of completion (presumed)	1898.	1898-99.	1897.	1897.	1897.
Material of hull	Steel.	Steel, wood sheeted, Muntz metal bottom.	Steel.	As before.	As before.
Length between perpendiculars	115·0 m.	120·0 m.	105·0 m.		
Breadth extreme	20·4 m.	20·4 m.	17·4 m.		
Mean load draught	7·85 m.	7·9 m.	6·25 m.		
Displacement in tons of 1,000 kg.	11,130.	10,650.	5,650.		
Armament—					
(1) Ordnance	Four 24 cm. in two armoured revolving turrets. Twelve 15 cm. Q.F. in armoured single casemates. Six 15 cm. Q.F. in armoured revolving turrets. Twelve 8·8 cm. Q.F. with shields. Twelve 3·7 cm. Q.F. machine guns. Eight 8 mm. Q.F. machine guns.	Four 24 cm. in two armoured revolving turrets. Six 15 cm. Q.F. in armcured single casemates. Six 15 cm. Q.F. in armoured revolving turrets. Ten 8·8 cm. Q.F. with shields. Ten 3·7 cm. Q.F. machine guns. Eight 8 mm. Q.F. machine guns.	Two 21 cm. in two armoured revolving turrets. Four 15 cm. Q.F. in armoured single casemates. Four 15 cm. Q.F. in armoured revolving turrets. Ten 8·8 cm. Q.F. with shields. Ten 3·7 cm. Q.F. machine guns. Four 8 mm. Q.F. machine guns.		
(2) Torpedoes	One 45 cm. stem tube. Four 45 cm. broadside tubes One 45 cm. stern tube.	One 45 cm. stem tube. Four 45 cm. broadside tubes. One 45 cm. stern tube.	One 45 cm. stem tube. Two 45 cm. broadside tubes.		
Armour—					
Belt	On $\frac{1}{5}$ length from forward thickness 300, 250, 200, & 150 mm. hardened steel.	All round the water-line, thickness 200 and 100 mm. hardened steel.	—	As before.	As before.
Turrets ...	24 cm. 250 mm. thick. 15 cm. 150 mm. thick.	24 cm. 200 mm. thick. 15 cm. 100 mm. thick.	21 cm. 100 mm. thick. 15 cm. 100 mm. thick.		
Casemates ...	15 cm. 150 mm. thick.	15 cm. 100 mm. thick.	15 cm. 100 mm. thick.		
Conning towers	280 and 150 mm.	200 and 100 mm.	200 and 100 mm.		
Armoured decks	On top of belt, 65 mm.; underwater armoured deck aft, 75 mm.; splinter decks, 20 mm.	On the citadel on top of belt, 50 mm.; before and abaft. 30 mm.; underwater armoured deck before and abaft, 50 mm.; splinter decks, 20 mm.	Horizontal above water part of protective deck, 40 mm.; inclined sides, 100 mm.		
Makers of machinery	Imp. Dockyard, Wilhelmshaven.	Imp. Dockyard, Kiel.	Germania Works, Tegel, Berlin.	Vulcan Works Stettin.	Weser Works, Bremen.
Number of screws	3	3.	3.	3.	3.
Indicated horse-power	13,000.	13,500.	9,000.	9,000.	9,000.
Engines	Vertical 3-cyl. triple-expansion.	Vertical 4-cyl. triple-expansion.	Vertical three-cylinder triple-expansion.	Vertical 4 cyl. triple-expan.	Vertical 4 cyl. Triple-expan.
Boilers ...	for $\frac{2}{3}$-pr. cyl. Scotch boilers. for $\frac{1}{3}$-pr. water-tube boilers.	for $\frac{2}{3}$-pr. cyl. Scotch boilers. for $\frac{1}{3}$-pr. water-tube boilers.	Niclausse boilers.	Belleville boilers.	Dürr boilers.
Speed at load draught	18 knots.	18·5—19 knots.	18·5 knots.	18·5 knots.	18·5 knots.
Coal capacity at load draught	650 tons (of 1,000 kg.).	1,000 tons (of 1,000 kg.).	500 tons (of 1,000 kg.).	500 tons (of 1,000 kg.).	500 tons (of 1,000 kg.).
Masts	Two military masts with fighting tops, foremast with inside ladderways.	As before.	As before.	As before.	As before.
Number of crew	655.	565.	439.	439.	439.

achieve the result that the vessels planned by German designers, and constructed out of German material in German dockyards shall be fully equal to the vessels of the old English and French Navies.

I hope that this may be the case.

Shipbuilding in Japan appears to be making some progress. Clyde builders are supplying plans for vessels that are to be constructed by the Japanese, and a considerable amount of steel and other material is being prepared and shipped for the work.

THE FLEETS OF THE MAIL LINES.

(*From our own Correspondent.*)

The Most Wonderful Piece of News

of the month in the connection which we especially regard, has surely been the sale of a Cunarder. I have long hoped to see the dispersal of the old fleet commenced, and at last we see a beginning made. Messrs. C. W. Kellock & Co., of Liverpool, have effected a sale of the *Atlas*, which has for some time been lying in the East Float at Birkenhead, and so she passes from the Cunard fleet. This vessel was for many years employed chiefly in the Boston trade, but it is nearly a decade since she made a western ocean trip, and her latter career has been entirely confined to the Mediterranean service. She was originally constructed as long ago as the year 1860 by Messrs. J. & G. Thomson, of Clydebank. Her tonnage was then 1,793 gross, and her length 277 ft. In 1873, however, when the Belfast yard had proved to the shipping world the advantage of long ships, the *Atlas*, with several of her sisters, was practically re-constructed. No less than 62 ft. were added to her length, whilst her tonnage was increased by one-third. At the same time she was given new engines and boilers by her original builders. This new machinery was, of course, on the compound principle, as by that time the simple engine was quite superseded.

The departure of a 36-year-old ship will, of course, help the average age of the fleet; but there are still of the same age the *Marathon* and the *Kedar*, with the *Morocco* only a year younger. The old *Samaria* is some seven years junior to these ancients, and since she has gone off the Boston line, she has found employment on the Mediterranean service.

La Compagnie Generale Transatlantique.

It has recently been somewhat the fashion amongst a certain section of the shipping press, certainly not the most enlightened section, to very much decry the vessels of this line. The object of these attacks need not be too closely inquired into. But the statements made may well, in so far as they are false, be corrected. I read in one publication that "the French Transatlantic Co. is awakening to the fact that it is hopelessly outdistanced in the Atlantic race. . . . At their best the fastest steamers they now have did not exceed a speed of 19 knots when they were new, and it is now a good many years since they were new." The writer then goes on to show how the call at Cherbourg by the Hamburg express boats will injure them. This suggestion invites a comparison between the French and the German boats. The Hamburg line's crack ship is the *Furst Bismarck*. She is undoubtedly the best ship which flies the German flag—in size, in speed, and in appointments. She is also the newest of the Hamburg express boats. *La Touraine* is the most recent of the French mail steamers, and is one of the vessels of which the good scribe says, "It is a good many years since they were new." This French vessel was launched in March, 1891—that is, five months after the date of the launch of the *Furst Bismarck*. The accusation of age therefore fails in her case, at least. Moreover, credit is not given to her for her speed, for she has averaged considerably over 19½ knots across the Atlantic in one voyage, of which I found a note in my books, and I did not by any means make an exhaustive search. I will admit that she is far the best of the bunch; but her sisters, though older, have had great improvements recently. I am inclined to think that the writer whom I am criticising has never heard of *La Touraine's* existence.

Another vessel of the French line has recently done very well on the West India route, making a record from Havannah to Corunna at a speed of 16·42 knots, a performance which would very much astonish a British West India mail steamer.

The Union Line

was said a little while ago to be about to increase its fleet. The rumour was contradicted with great promptitude, but it was only a little premature. The directors have now given a very important order to the Queen's Island yard. The "G"'s on the intermediate service have proved so great a success that an order for no less than three more has been placed with the builders who originated the design. The size, it is true, is to be materially increased. That is, of course, in view of the rapid expansion of the trade in which they are to be engaged. But the design and arrangements will be identical with those of the vessels which have so much endeared themselves to tourists, and to all who are not pressed for time. The intermediate service is a fortnightly one, alternate with the mail service. A fleet of six steamers is all that is necessary to maintain a fortnightly service to the Cape, and so the present instalment of "G"'s will be ample to give one every fortnight, and provide a reserve ship as well. Thus with the improved *Scot* and *Norman* there will only be four Saturdays in three months when a twin screw boat is not available for Capetown from Southampton. It will be curious to notice when the Castle Line finds it necessary to follow suit, and to discard the single-screw principle. We hardly count the West India Royal Mail Company among the important passenger lines of the country, and, if we leave them out, we find only P. & O. beside the Castle Line still building single-screw mail boats. The Castle Line does not go in for the double screw at all, but P. & O. is obviously wavering as for its secondary services, it now has more than one double screw boat in order. The accident to the *Himalaya*, which had to put back to Plymouth on the 5th July. owing to a slight breakdown in her engine department, onght to be another and strong hint in favour of duplication.

The Fleets of the Narrow Seas

are about to have some very important accessions. There is first the new steamer of the London and South Western Railway Co., built by the Clydebank firm which turned out those successful boats the *Columbia* and *Alma* (not *Albia*, as the daily press will call the latter) to succeed the vessel they lost last year. Then there are two new vessels ordered from the Naval Construction and Armaments Company at Barrow for the Great Western Co.'s route from Weymouth to the Channel Islands. These will be twenty-knot twin-screw boats, and about 15 ft. longer than the largest of the vessels of the same class already employed on the service. A twin-screw passenger steamer has also been ordered by the Chemin De Fer De L'Ouest of France for the Newhaven and Dieppe service, which that line works in conjunction with our London, Brighton and South Coast Railway. The vessel is to be a sister to *La Tamise*, already employed on the station, and will be built on the other side of the channel by the same builders, the Forges et Chantiers Mediterranée of Havre.

In more Northern waters the Belfast Steamship Co. has added another twin-screw vessel to its fleet. This is the *Comic*, built for their Londonderry service.

A Correction.

I have to thank the American Line for the great courtesy and promptitude with which they corrected an error of mine in making out the speed of the *Teutonic* on her last homeward run I said it was 21·17 knots. The fact was, I made it a knot more than it should have been, the true speed being 20·168 knots.

Letters to the Papers

are of very various kinds. Many of them are most useful, and coming, as they often do, from students and experts, convey independent information which the public might never otherwise obtain. Still every good thing is open to abuse, and I venture to think that some of the letters to the papers in reference to the loss of the *Drummond Castle* would have been better left unwritten. Certainly, if they had to be written to ease the minds of the writers, a wise editorial discretion would have consigned some of them to the waste-paper basket. For many of them reflected on matters which were certain to occupy the attention of the Court of Inquiry, so promptly ordered by the Board of Trade, and others very strongly attacked the professional reputation of the dead officers. These letters must have caused great pain to relatives and friends of the men who had died at the post of duty. Another class contained suggestions, based on no proper foundation, which were very largely calculated to injure the line which had had a misfortune after so long a period of immunity.

Many persons who are not open to rebuff are afraid of ridicule, and so the writer of the letter which appeared as from a sea-cook in the columns of the *Standard* deserved well. He pleaded for his class, and showed how they were nowadays neglected. In former times the questioning passenger was referred to the white-capped official. Now the inquiring gentleman who, when leaving Shanghai, asked a deck officer if "he would be at Gravesend in time to catch the 2.30 p.m. train," was referred not to the cook, but to the surgeon. The cook, too, had not had an innings in the *Drummond Castle* correspondence. This is fooling, of course, but it is fooling which may tend to stop the practice of ill-considered letter writing which, as I have endeavoured to show, may cause great pain and undeserved injury.

The French Tourist Steamer's Accident

on the coast of Norway was an opportunity to the German Emperor for showing one of those civilities for which he is distinguished. He happened to be yachting also in the neighbourhood when the accident occurred, and sending vessels from the flotilla which accompanied him, he was enabled to assist the *General Chanzy* off with little delay and slight damage. The German Emperor's courtesy stands out in fine relief against the conduct of the captain of the British ship who is alleged to have charged the passengers four pounds a head for landing them.

The Austro-Hungarian Lloyd

is a company which we do not hear very much about in England as its vessels do not trade to our home ports, but it is one which in the Mediterranean and the Far East has long had a large trade and considerable influence. In 1895 the mileage steamed was a very trifling amount short of two million nautical miles, and the fleet carried no less than 276,000 passengers. New and fine vessels, called after the famous ancient queens of Egypt, have been placed on the line from Trieste to Alexandria, and special services with their sailings are carried out by trains *de luxe* from Vienna, with connections back to Ostend, where they meet the sailings of the fine paddle steamers of the Belgian Government from Dover. There are two fine and very large vessels now building at the Arsenal at Trieste for the Japanese service. These will have a deadweight capacity of upwards of 7,500 tons each. The concern is, of course, aided by the State to a certain extent, and is in a flourishing condition, as it is enabled to make a moderate return to its shareholders, the dividend for the year being four per cent.

The Cunard Company.

A few paragraphs back I spoke of the sale of the *Atlas*. The *Palmyra*, a vessel six years her junior, has also been sold, and as there are other vessels of the same kind which are likely to follow them, I think it may be interesting to give a list of the vessels of the fleet, excluding tugs and barges, as they stood at the date of the last report.

I arrange the vessels in seniority.

Vessel.	Service.	Year built.	Age.	Gross tonnage.
		GROUP A.		
British Queen	Havre ...	1849 ..	47 years	764
Marathon ...	Mediterranean	1860 ...	36 ,,	2,403
Atlas	,,	1860 ...	36 ,,	2,393
Kedar ...	,,	1860 ...	36 ,,	1,783
Morocco ...	,,	1861 ...	35 ,,	1,855
Tarifa ...	,,	1865 ...	31 ,,	2,146
Aleppo ...	,,	1865 ...	31 ,,	2,143
Palmyra ..	,,	1866 ...	30 ,,	2,044
Samaria ...	,,	1868 ...	28 ,,	2,605
		GROUP B.		
Trinidad ...	Mediterranean	1871 ...	25 ,,	1,899
Cherbourg ...	,,	1874 ...	22 ,,	1,614
Bothnia ..	Boston ...	1874 ...	22 ,,	4,535
Scythia ...	,, ...	1874 ...	22 ,,	4,557
Gallia ...	,, ...	1878 ...	18 ,,	4,809
Servia ...	,, ...	1881 ...	15 ,,	7,392
Catalonia ...	,, ...	1881 ...	15 ,,	4,841
Cephalonia ..	,, ...	1881 ..	15 ,,	5,517
Pavonia ...	,, ...	1881 ...	15 ,,	5,588
		GROUP C.		
Aurania ...	New York	1882 ...	14 ,,	7,269
Umbria ...	,,	1884 ...	12 ,,	7,718
Etruria ...	,,	1884 ...	12 ,,	7,718
Campania ...	,,	1892 ...	4 ,,	12,950
Lucania ...	,,	1893 ...	3 ,,	12,952
		GROUP D.		
Carinthia ...	Boston, cargo	1895 ...	1 ,,	5,591
Sylvania ...	,,	1895 ...	1 ,,	5,598

I do not think it by any means fair to the direction of the company to lump the whole fleet together and average all the vessels together. But it is very difficult to see how the thing is to be done fairly.

For convenience I have divided the fleet into four groups. The first group consists of vessels which were given compound engines in the early seventies when it was seen that the compound system was so great a commercial necessity. The *Aleppo* has since had tri-compound engines fitted. In this group I include nine ships of the average age of 31 years and aggregate of 18,136 tons. This, I think, works out at 2,015 tons apiece and an average age of 34½ years.

The next group I have made to contain nine vessels. These have all their original engines of the compound type and none of them have been lengthened, as have many in the first group. I make the aggregate age 169 years and the tonnage 40,752 tons. This makes the average 18¾ years and 4,528 tons.

In the third group are the New York mail boats, with their reserve. Three of these vessels are single screws with compound engines. The two newer ones of course have twin-screws and triples. Their total age is 45 years and tonnage 48,607 gross. This is an average of 9 years and 9,721 tons.

Lastly come the modern cargo vessels, whose age is only one year. They aggregate 11,189 tons.

To the last group will have to be added the three new passenger and cargo boats of 5,000 tons each ordered in July, 1896, from Messrs. Workman, Clark & Co., Limited, of Belfast.

I leave my readers to make their own deductions and comparisons, merely observing that the departure of the *Atlas* and the *Palmyra* reduces the first group by two vessels and 4,437 tons. It makes a very slight improvement in the average age of that group.

Record Making.

The way in which the word "record" is used by the daily press, at all events as regards mail steamers, is deplorably loose. I read in one London journal that on a certain voyage the *Lucania* "won the so-called race" against the *S. Paul*. That "the *Lucania* established a record in ocean steaming by covering no less than 560 knots from noon on Thursday till noon on Friday." Here I might make two criticisms if I were in a critical mood. One is that "knots" is a rate and not a distance. The *Lucania steamed* at so many "knots." But what she *covered* was so many nautical miles. This error is so frequent nowadays that it seems hopeless to try and correct it. The other point in this sentence is the fact, probably unknown to the writer, that she did not then "make a record," for she had already done so by steaming that distance herself in a westward day on a previous voyage. Of course, no other vessel has equalled the performance, which was the fastest on record, but the earlier one established it, and this could only equal it and did not beat it. But what I want to find fault with chiefly is the following remark: "During the same space of time the *S. Paul* steamed 540 knots, which, though 20 knots less than that of the Cunarder is itself a record." How could it be? It was perhaps, and, indeed, certainly, the best day's steaming the *S. Paul* has done, but from the writer's own statement it could not be the best day's steaming on record. And this is what "a record" means in this connection.

Fast Steaming on the Atlantic.

The Cunard steamer *Servia* was sent for the first time on the Boston route in June, returning at the beginning of July. She is the finest and fastest vessel yet sent by Cunard's to that port. She therefore wrested the first place in speed from the *Gallia*, which has held the lead since she went on that station. The *Servia* was built, as most builders will remember, in 1881, the year which saw the *Alaska* and the *City of Rome* come out. Whilst these two ships were built of iron the *Servia* was distinguished as being constructed of steel. But the Clydebank-built vessel never attained the New York record, which was passed from the *Arizona* direct to the *Alaska*. It was therefore left for the *Servia* to make her first record when fifteen years old, on leaving the New York route. She reduced the westward time of the Boston voyage to about seven days and the eastward to something like four hours shorter. The occasion of her being put on the station was a special one, she being engaged to bring the Boston Artillery Company to Europe, on their notable visit.

As regards the New York voyage, I must warn readers who watch closely the runs of the present flyers, that all times given as arrivals at New York must be closely scrutinised, as in some cases "New York" is made to include Fire Island, which is a good hour and a half short of the goal at Sandy Hook. I will give a case in point. The *S. Paul* on her fastest trip was reported as arriving at New York at noon on the 5th June. The published time was "Sandy Hook 2·6 p.m. on that day." I could give other instances of similar looseness of expression on the part of those who publish information regarding this vessel and those which run in conjunction with her.

Calls at French Ports

are now being made by two lines which, at least recently, have not made France an objective. The one is the old National Line which, under its new managers, has instituted a fortnightly service from London to New York *via* Boulogne. The vessels engaged are the *Europe* and the *America*, the remnants of the old fleet, assisted by one of the Atlantic Transport Company's ships. Of course, as the two lines are now under identical managements and are practically one interest, the National Line can command any assistance it may require in the matter of tonnage from the Transport fleet.

Another, and perhaps more important, change has been the discontinuance of their call at Southampton by the North German Lloyd, as far as their boat at the beginning of the week is concerned. Time was—and that not so long ago—when the North German Lloyd service from Southampton was tri-weekly, and even then we occasionally saw an extra sailing. Now the service is a weekly one, with one of their best vessels on Wednesdays. The Sunday boat calls at Cherbourg, and passes Southampton by altogether.

Against this, from the Southampton point of view, may be put the fact that the *Mexican*, of the Union Line, arrived at Southampton on the 19th July from the Cape and Madeira direct. She omitted to call at Plymouth and future Union Liners will follow her procedure.

A Notable Experiment

is now being tried with regard to the *Scot*. I have from time to time told how the *Scot* has been away from her work for six months and has visited the Queen's Island yard, where she has been lengthened fifty-four feet and increased in gross measurement by nearly a thousand tons. She left Belfast on the 10th July, embarked a large party at Holyhead next day and proceeded thence to Southampton. Those on board included the Speaker of the House of Commons, who was due in London on Monday, but the sea knows no time-rule and a dense fog stopped all progress for some hours off the Lizard. The following Saturday saw her sail on her regular voyage to the Cape, and the speed she makes and her general behaviour will be watched with interest, for—as is usual with the work of Messrs. Harland & Wolff—there was no trial trip, in the sense of a measured mile spin, or of a period of hard steaming, and the voyage is the ship's real trial trip.

Belfast

has another feather in its cap by the receipt of the order from Cunard for three five-thousand ton ships. I have already mentioned the fact in another connection, but it is necessary to remark on this departure of the premier Atlantic Company from the Clyde, and also to comment on the fact that Messrs. Workman, Clarke & Company have secured clients of so good standing. The fact is that the progress of this firm has been very marked of recent years, and Belfast looks as though it would have even more of the cream of the shipbuilding trade than has hitherto fallen to its lot.

Publications.

From the Union Steamship Company I have received two booklets, both of considerable interest, especially at the present moment. The one is entitled "The Greater Scot," and gives an account of the vessel which is at present causing so much talk amongst shipping men. The sub-title is the Albatross of the South, which is apparently the familiar name of the Cape record holder, just as fifteen years ago all Atlantic travellers called the *Alaska* the Greyhound of the Atlantic. The little volume is profusely illustrated. There is an excellent representation of the pretty vessel, for pretty she still looks, despite the alterations and her increased size. An excellent likeness of Captain Larmer, her able and popular commander, serves as a frontispiece, and likenesses of many of the officials of the company are worked into the margins of the pages. An account of the process of lengthening the vessel, as so successfully carried out by Messrs. Harland & Wolff, is given, and this is accompanied by several explanatory illustrations. The internal arrangements of the vessel are also referred to in a chatty manner and a good idea given of the comforts and luxuries to be found on board her by passengers of all classes.

Another volume from the same office is entitled "The Four G's." In view of the order recently given to build three more of the same class of ship, this has an additional interest. The illustrations here are chiefly taken from the *Gaul*, but, save for the name, they would do for any of the four, as the vessels are almost identical. Some excellent illustrations are here afforded, especially those of the engine-room and engine-room staff of the *Gaul*. Then there is a view of the second-class saloon of the *Gaul*, which, if one did not know the way in which the Union Company treats its intermediate passengers, would make one imagine that the printer had got adrift and put "second" when he meant "first."

Co-operative Educational Travel,

under the guidance of Dr. Lunn and the Rev. Woolrych Perowne, offers a large number of voyages, both by sea and land, to those who wish to combine a course of plain living and high thinking. At least the extremely low fares, which are in all cases inclusive, would make one think the living must be plain, though judging by the names of those who join the tours one may be sure that everything is of the best. Those who travel by these tours have the advantage of instruction and amusement from such authorities as Mr. Edward Whymper, the mountaineer, Sir W. B. Richardson, the physiologist, and Dr. Andrew Wilson, Mr. Boyd Carpenter, and Sir Walter Foster, all men well known to the public in different departments. The vessel which is employed for the northern cruises is the large public yacht *Midnight Sun*. On her next trip northwards she is so full that some of the guests have overflowed into a tender of ordinary passenger steamer size.

Messrs. Thos. Wilson & Company, of Hull, have sent me a pamphlet of

"Particulars of their Royal Mail, Passenger and Cargo Services"

for the present season. This gives charts of the northern countries of Europe, where Messrs. Wilson originated the business which has done so much for the port of Hull, and which has extended till it embraces almost every trade. The green hulls of these ships may be seen now in the harbours of Boston, New York and Baltimore, on the western shores of the North Atlantic, and in the River Plate ports in the southern hemisphere. In the far south they reach Australia, both round the Cape and through the Canal, whilst in the Mediterranean and the Black Sea they have almost as many ports of call as in northern waters. The sailing lists before me give particulars of all these services, with dates of sailing, rates of passage and cabin plans. Such services as these require an immense fleet, and at present there are eighty or ninety vessels under the flag. The largest is the *Idaho*, built on the Clyde this year. She is upwards of 5,600 tons gross, but there are other modern vessels of but slightly smaller size. I propose in an early issue to give some history of this line, as I recently did of some of the fleets of the Narrow Seas, but the fleet is so extensive that one's materials take some time for collection and arrangement.

TRIAL OF A TORPEDO GUNBOAT FOR THE CHILIAN NAVY.

THE torpedo gunboat *Almirante Simpson*, built and engined by Messrs. Laird Bros., Birkenhead, for the Chilian Government, was taken for her official trials on Thursday, July 23rd. The runs were made in accordance with the Admiralty conditions on the measured mile at Skelmorlie, with an average of $21\frac{1}{2}$ knots on six runs on the measured mile, and a mean speed for three hours running of $21\frac{1}{4}$ knots, the contract speed being 21 knots. On the natural draught trial of six hours' duration a mean speed of $17\frac{3}{4}$ knots was obtained with $\frac{1}{2}$ in. air pressure, being $\frac{3}{4}$ knot in excess of contract, the coal consumption in both cases being very light. The vessel is similar to the *Almirante Lynch* and *Almirante Condell*, built by the same firm for the Chilian Government in 1890, and Her Majesty's ships *Onyx* and *Renard*, built in 1893. Her length is 240 ft.; beam. 27 ft. 6 in., and she is built of steel. The thickness of the side plating abreast the machinery is increased to afford additional protection. She has a topgallant forecastle and half poop, which give accommodation for officers and crew. The builders have also supplied and fitted the armament, which consists of one bow and two broadside 18 in. torpedo tubes, two 4·7 in. quick-firing guns of Armstrong's most modern type, four three-pounder quick-firing guns and two rifle calibre machine guns by Maxim-Nordenfeldt. The machinery consists of two sets of triple-expansion engines, driving twin-screws, supplied with steam at 200 lbs. pressure from four water-tube boilers of the modified Normand type, first introduced by the builders, and has extra large evaporators and distillers. This vessel has been rapidly constructed, the order having only been placed in September of last year. Admiral Uribe, the President of the Chilian Naval Commission, was on board, and with him Captain Romulo Medina, Captain Perez and Lieut. Schroeder, of the Chilian Navy; Mr. J. Forbes, engineer, Inspector for the Commission; Mr. Nichols, representing Sir E. J. Reed (who was unavoidably absent), and Mr. William Laird and others. Mr. Ratsey Bevis was in charge of the machinery.

THE NEW PADDLE STEAMERS "DOVER" AND "CALAIS."

We present our readers in this number with a double-page plate of one of the London, Chatham and Dover Railway Co.'s new sister vessels, *Dover* and *Calais*, which are now running the cross Channel service between Dover and Calais.

In our March and April numbers of this year we gave full descriptions of the vessels in our accounts of the trial trips.

The principal dimensions are:—Length between perpendiculars, 280 ft.; breadth, moulded, 35 ft.; depth to promenade deck, 22 ft. 3 in.; with a gross tonnage of 979. She is built of steel throughout, and is subdivided into nine watertight compartments by means of bulkheads extending to main deck. There is a complete promenade deck extending the full breadth of the vessel, forming a roomy and comfortable promenade for passengers in fine weather and an effectual shelter against storm or rain.

We are indebted to Messrs. Adamson & Sons, of Rothesay, for the photo.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our own Correspondents at home and abroad.)

The Naval Mobilization:

THE partial mobilization of ships in the Fleet Reserve and of the Port Guard and Coast Guard ships, took place on July 8th. The operation, which obliged the hoisting of twenty-seven pennants, was performed without the slightest mishap, and with the smoothness of a well-oiled machine. Of the ships commissioned only one is a battleship, the *Sultan* now restored to the effective list of the Navy after her sojourn at the bottom of the Comino Channel. In her restored condition she is uncommonly ugly, for her two masts show no trace of symmetry and rake in different directions. She is likely to prove, however, an effective vessel, although why when she was being fitted with new engines and boilers the electric light was not also supplied is one of those things not to be understood outside the Admiralty. She was commissioned at Portsmouth, and with her the cruisers *Iphigenia*, *Iris*, *Indefatigable*, *Latona*, *Naiad*, and *Melpomene*, two torpedo-boat destroyers, and twelve torpedo boats. From Chatham came the largest number of cruisers, these comprising the *Severn*, *Brilliant*, *Thetis*, *Tribune*, *Terpsichore*, *Andromache*, and *Apollo*. The Medway contingent was made up by the gunboats *Jaseur* and *Alarm*, one destroyer, and six torpedo boats. Devonport contributed the cruisers *Sirius*, *Phæton*, *Forth*, and *Pearl*, the gunboats *Antelope*, *Hazard*, *Harrier* and *Hussar*, with six torpedo boats. The new battleship *Renown*, which at one time it was supposed would hoist the pennant, did not commission. Altogether, with the torpedo boats, fifty-one pennants were hoisted on July 8th, the number of officers and men joining the ships numbering about seven thousand. It is very satisfactory to know that in spite of this large call upon the Reserves there are still a number of ships ready for sea, and sufficient men in the depôts, &c., to keep the gunnery schools going.

Assembling for Instruction.

As soon as the vessels were commissioned they were sent out of harbour, made their steam trials and then proceeded to the two ports at which the fleets were assembled preparatory to the manœuvres. Instead of the usual breaksdown, casualties and mishaps, all the ships, with one notable exception, arrived at the ports of assembly without mishap. The exception was the gun vessel *Landrail*, and the accident which occurred to her prevented her from taking any part in the subsequent operations. She was on her way from Sheerness to Portland when she came into collision with a merchant ship homeward bound from Australia. This vessel sank, happily without loss of life, and the *Landrail* arrived at Portland seriously damaged. The collision appears to have taken place in a fog. The other vessels all reached their ports, and without any defects of a serious nature. At Plymouth the Reserve squadron assembled, consisting of the following vessels: Ships of the line—*Alexandra*, flag of Vice-Admiral E. H. Seymour; *Sans Pareil*, flag of Rear-Admiral A. K. Wilson; *Reuben*, *Edinburgh*, *Colossus*, *Sultan*, *Dreadnought*, *Thunderer*, *Devastation*. Cruisers—*Australia*, *Galatea*, *Iris*, *Mersey*, *Melampus*, *Iphigenia*, *Terpsichore*, *Brilliant*, *Indefatigable* and *Pearl*. Gunboats—*Leda*, *Niger*, *Renard*, *Circe*, *Jason*, *Sharpshooter*, *Sheldrake*, and *Jaseur*. The following vessels, which belong to this fleet, were attached to the torpedo-flotilla, consisting of 24 boats: *Phæton*, *Spider*, *Curlew*, *Seagull* and *Onyx*, the last named taking the place of the *Landrail*. The Channel fleet at Portland consisted of the ships of the line—*Majestic*, flag of Vice-Admiral Lord Walter Kerr; *Magnificent*, flag of Rear-Admiral A. T. Powlett; *Royal Sovereign*, *Empress of India*, *Repulse* and *Resolution*. Cruisers—*Blenheim*, *Hermione*, *Charybdis*, *Naiad*, *Sirius*, *Apollo*, *Thetis*, *Tribune*, *Forth*, *Severn*, *Latona*, *Andromache*, *Melpomene* and *Bellona*, with eighty gunboats and twenty destroyers.

The Torpedo Flotilla.

It is to be noticed, and at the termination of the manœuvres will doubtless give rise to some controversy respecting their individual merits, that the mobilized fleets this year contain a considerable proportion of vessels whose armament is principally or wholly torpedoes. Thus there are no less than nineteen torpedo gunboats, of what used to be called the "catcher" type. This class of vessel became wholly discredited at one time because they were continually breaking down, and, moreover, could not catch the torpedo boats. The original boats, of which the *Spider* is the sole representative in this year's manœuvres, have been frequently improved upon, and all the types send one or more specimens, including a couple with water-tube boilers. In addition to the *Spider* of 525 tons, there are the *Seagull*, *Sheldrake*, *Sharpshooter*, and *Spanker*, of 735 tons, the *Jaseur*, *Jason*, *Circe*, *Renard*, *Onyx*, *Niger*, *Leda*, *Antelope*, *Alarm*, and *Speedy* of 810 tons, and the *Hazard*, *Halcyon*, *Hussar*, and *Harrier* of 1,070 tons. The performances of these boats are being watched with great interest, but still more attaches to the behaviour of the torpedo-boat destroyers, of which there are twenty attached to the Channel Squadron. Messrs. Laird supplied five boats, the *Dragon*, *Ferret*, *Contest*, *Lynx*, and *Banshee*, fitted with Normand boilers; Messrs. Thornycroft supply four fitted with their own boilers, the *Decoy*, *Boxer*, *Bruiser*, and *Daring*; the Palmer Co. supply three, the *Lightning*, *Janus*, and *Porcupine*, fitted with Reed's boilers; the Fairfield Co. supply three fitted with Thornycroft's boilers, the *Handy*, *Hart*, and *Hunter*; Messrs. Yarrow supplied two, the *Havock* and *Hasty*, these are fitted with locomotive boilers; Messrs. Earle's supply two, the *Salmon* and *Snapper*, fitted with Yarrow's water-tube boilers; and Messrs. Hawthorn supply one, the *Sunfish*, also fitted with Yarrow's boilers. The torpedo boats attached to the Reserve Fleet are twenty-four in number. Messrs. Thornycroft provide Nos. 55, 59, 52, 57, 58, 59, 27, 49; Messrs. Yarrow, Nos. 64, 66, 67, 68, 71, 74, 73, 76, 77, 79, 81, 85, 87, and Messrs. White Nos. 81 and 95. Not to have anticipated any mishaps would have been to expect the impossible, but in the early stages of the manœuvres at all events the boats acquitted themselves well.

Portsmouth Dockyard.

This yard grows apace, but it is never sufficiently large apparently for the work to be done in it. The truth is, that new methods cause new rules and ways that were suitable in days gone by, are not any longer effective. In the old leisurely time, a job could be done in a workshop, and when finished taken to the ship; to-day it is—take the tools to the ship and do the job there. The result of this is that the yard is always inside out, and this gives an appearance of untidiness and want of sufficient room, which is not perhaps actually justified. Nowadays we are really clearing up at this yard, and soon we shall want more work or there will be idling. By the end of October the *Prince George*, the biggest of our ships in the Dockyard Reserve, will be complete and passed into the "A" division of the Fleet Reserve. The next thing we shall know about her is that she is to be commissioned. By the end of August her sister ship, the *Cæsar*, should be floated out of dock, for she is already bored out for her shafting, and all her machinery has been delivered by the contractors. The new *Renown* is to be begun in the dock as soon as she vacates it, so that this will be some new work. But the *Eclipse* is nearly out of hand, and the *Gladiator* is growing towards a condition for launching, so that Portsmouth is pretty sure to be in the building programme next year. The mobilization was our greatest effort last month, and everything passed off splendidly. We are going to have the *Landrail* here for refit, and when the manœuvres are over there will be a pressure again. For the present our attention is mainly directed to the *Powerful* and *Terrible*, and preparation for their steam trials. The schooner *Reaper*, recently run down by a torpedo boat, has also been under repair.

Distant Signalling.

One of the important questions which are continually cropping up in connection with naval tactics concerns the various methods of signalling for long distances at sea. Several inventions, the result of engineering ability, have been introduced in the naval service for the purpose, and a masthead semaphore, which has been connected with the names of Rear-Admiral Wilson and Captain Ninsloe has now been officially adopted, and is to be fitted to all vessels of the Royal Navy. Although, however, it must be assumed that the reports on this apparatus have been uniformly satisfactory, it is far too soon to suppose that the problem of long-distance signalling at sea has been finally solved. All that can be said is that the semaphore is better than some others. The collapsing double cone of Prince Louis of Battenburg and Captain Percy Scott has been considerably improved, and may even yet be made more useful, and less liable to collapse. The drum of Admiral Fane, old-fashioned though it be, has several good points about it. Both these systems may yet be more generally satisfactory than they have so far proved. As to the night signalling apparatus of an Austrian naval officer, it is not equal in handiness to that of Admiral Colomb, which still stands against all comers. Other systems will come to the front in time, and here at least is a sphere in which inventive genius can have full scope with fair certainty of immediate and remunerative return for success.

Chatham Dockyard.

Now that the mobilization has taken place our basins assume a rather deserted appearance, less by reason that there are not plenty of ships still there than because the dozen or more vessels in the Fleet Reserve are more scattered. For one thing, the departure of our mobilised cruisers and gunboats enables the authorities to turn their undivided attention to building work, which will doubtless be pushed on more rapidly. The *Blenheim* was the most serious of the repairing jobs, and she appears to have had a nasty knock in the Baltic. It must have been a good big wreck she ran across to do so much damage. Of the four ships building, the *Minerva* is having defects in the crown plates of the boilers made good, and will make her trials almost immediately. The *Venus* will probably be the next in that category, but not much is being done to her yet. A fresh start has been made with the *Vindictive*, for owing to the non-delivery of her gun and gun shields, which will not now be delivered much before the middle of August, some of the men on the *Victorious* have been turned over to her and she is now a scene of activity which has been quite unusual. The *Illustrious* goes on as before, and there is nothing new to report about her. A couple of destroyers have been making trials. The *Swordfish* has been accepted, although on the metre hour run she could not keep up 27 knots; as, however, the engines developed more than the stipulated H.P.. this will probably come in time. Her contractors are altering the furnaces of the *Hardy* in consequence of some difficulty in connection will the coal consumption trials. The *Sappho* paid off here on July 17th, and the *Arethusa* on July 22nd.

Water in the Boilers.

Three curious incidents have recently occurred, in each case it being suspected that owing to the scarcity of water in the boilers a catastrophe was imminent. The first case reported was the *Trafalgar* in the Mediterranean. She had come out of the dockyard hands and was running on trial when some difficulty was experienced in keeping the water in the boilers, and something very like a panic took place. It is said that the men who ran out of the stokehold were newly joined stokers, but panics are very catching, and it is to be hoped that the result of any enquiry will be made public. Fires being drawn no mishap occurred. In the next case we have the *Blake*, which, as it is still the subject of judicial enquiry, is better not commented on. But that the crowns of the furnaces came down is not in dispute, and one man was scalded to death. Experts appear to be at variance on the subject of whether there was or was not sufficient water in the boiler, and this is the point to be settled. Finally, in the *Phæton*, off Milford Haven, a difficulty was experienced in keeping the water in the boilers, and fires were drawn in too. We do not hear of any panic here, and it is to be trusted there was nothing of the kind, but three cases of this kind are rather curious and not a little disquieting. The reason assigned in the case of the *Phæton* is that the feed pump escape valves were not weighted sufficiently, and that the water returned to the tanks instead of going into the boilers. This may have been the case, but that it was not promptly discovered argues some kind of negligence or want of knowledge. Are the young engineers of the Navy placed in positions of responsibility too soon? is a question asked by one paper.

Devonport Dockyard.

In spite of the mobilization and the number of vessels taken from this port the yards do not look empty, and work is proceeding as briskly as ever. The only vessel upon which there has been any relaxation of effort is the *Talbot*, upon which great activity was apparent just before the mobilization, leading to the belief that she would hoist the pennant. The notion was that the crew of the *Blake* would be turned over to her in consequence of the boiler accident on the latter ship; however, the *Melpomene* at Portsmouth was commissioned instead, and now the *Talbot* is going on as she was before. The *Renown* is practically finished and beautifully finished too—she is a credit to Pembroke and this yard, and until we build our own battleship she is our pride and glory. The *Arrogant* has received an accession of strength in the shape of more men, but the *Furious* goes on but slowly. This is all our building programme until the new *Renown* is taken in hand. Of course the mobilization gave considerably extra work, the defects of the *Australia* and *Indefatigable*, and of several torpedo boats, being taken in hand at Keyham, but in this direction the work was nothing to what it has been on former occasions. I am writing too early to report upon destroyer work, and shall leave that for next month, but doubtless we shall have our share of it. A sad accident happened here to one of the workmen engaged on the *Furious*, he slipped while walking across a plank and falling into the dock was killed instantaneously. At the coroner's inquest it appeared that insufficient care was taken to make these plank gangways absolutely safe. The *Northampton* training ship came in at the end of July and the *Nautilus* training brig, which was in collision the early part of the month, has been put out of dockyard hands and returned to duty.

Carrier Pigeons in Naval Warfare.

The work of training carrier pigeons for conveying messages at sea is at last to become a Government matter in this country, the naval authorities being about to take it in hand. What the Americans and the French have done our officers can do, and hitherto have done without official encouragement. There are establishments already at Devonport and Portsmouth, and experiments of a most interesting nature have been made with the birds from both ports. Naturally work carried on at the private cost of the officers is at some disadvantage, but at the Devonport establishment, in the naval barracks at Keyham, there are over fifty splendid birds which have been trained to cover the ground west of the dockyards on the Tamar. The greatest distance yet traversed by one of these birds, which are

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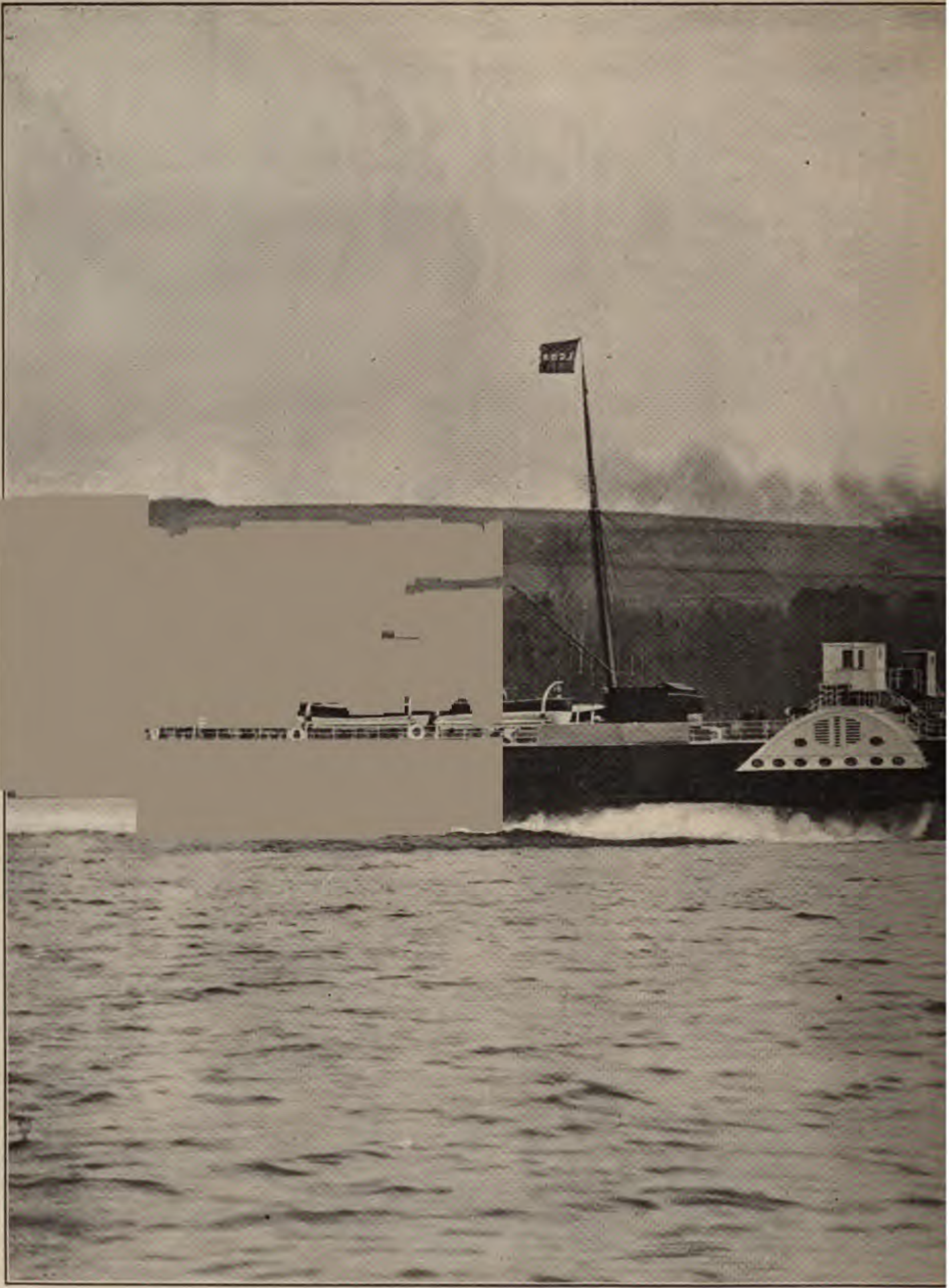
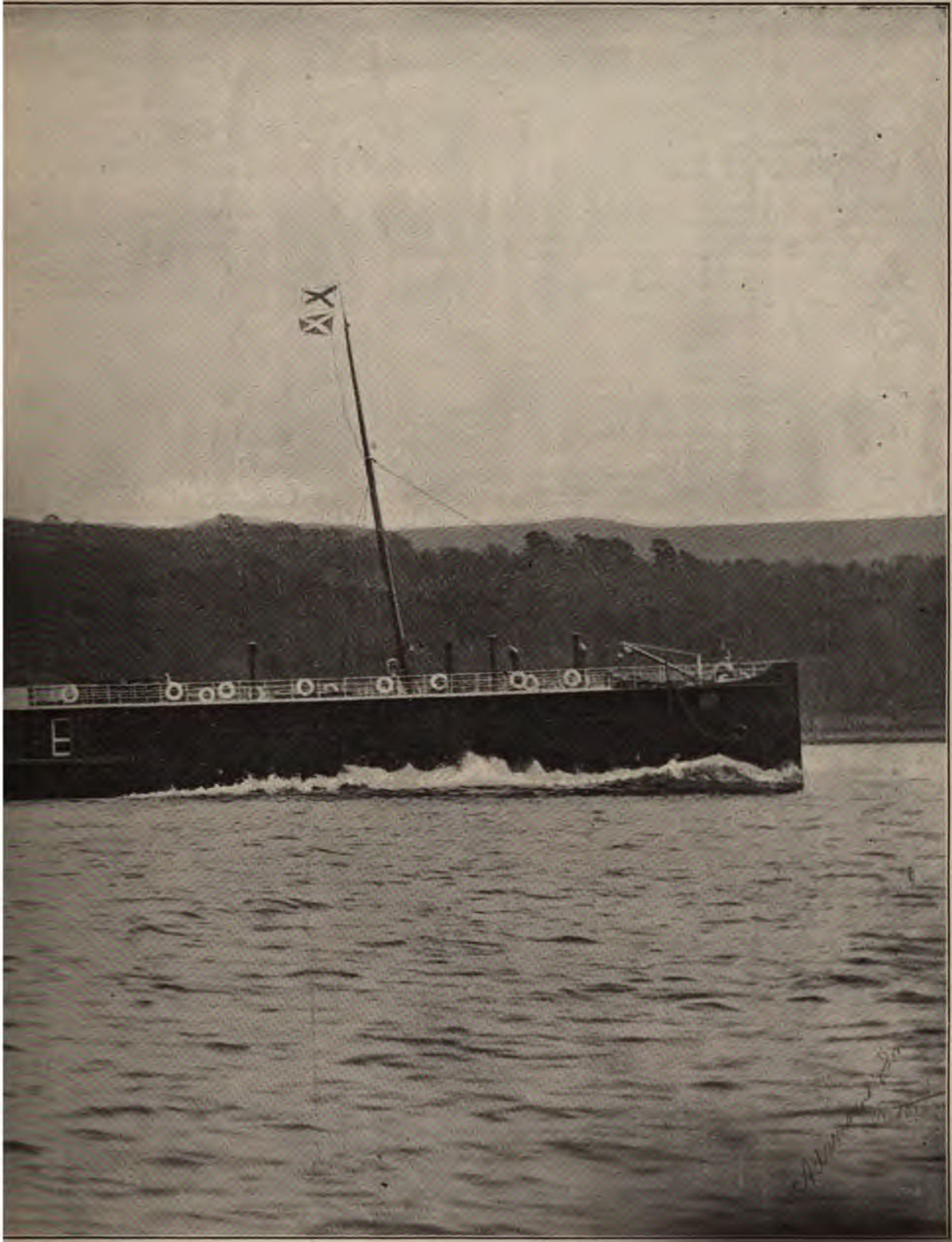


THE LONDON CHATHAM AND DOVER RAILWAY CO.'S PADD



'CALAIS," BUILT BY MESSRS. WM. DENNY & BROS., DUMBARTON.

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sent to sea for the purpose in torpedo-boat destroyers of the instructional flotilla, is seventy-five miles, or from the Wolf Rock in the neighbourhood of the Scilly Isles. Similar distances have been covered by birds from Portsmouth, and in the United States Navy it has been decided to fit certain cruisers with apparatus for carrying pigeons, great numbers of which are to be trained at their naval stations. This step is taken as the result of a long series of exceedingly interesting and most satisfactory trials in which some of the birds attained a speed of forty miles an hour. After results so encouraging it is quite time that the authorities gave their support to the undertaking, and it is understood that they will now take over the establishment at Keyham and carry on the training of the birds by means of a torpedo-boat or other suitable craft.

Sheerness Dockyard.

The part played by this yard in the mobilization is not a heavy one, as no vessels actually commissioned here. But all the Chatham ships, after hoisting the pennant, embark their ammunition at this port, and also adjust their compasses. Altogether the mobilization affects us very slightly, although it has taken away our guard-ship, the *Sans Pareil* and the gunnery tender, the *Landrail*. So far as building is concerned, I have nothing of importance to report. The *Pelorus* is being prepared for her steam trials, which in their way are nearly as important as those of the *Powerful* and *Terrible*, for she is the first of a new class, and a numerous one by the look of it. Some people call her a torpedo-boat destroyer catcher, but that is to be seen. The *Proserpine* will grow faster soon, and probably her record will be a better one than that of the *Pelorus*, as we have experience to guide us. There are a heap of old things in the Dockyard Reserve, the *Garnet*, *Castor*, *Egeria*, *Wrangler*, *Tourmaline*, *Ruby*, and *Caroline*. What is to be done with some of these ships, except to sell them or break them up, nobody knows. No decision has been reported as to the future of the *Castor*, but some of the others we know are to go to the ship-breaker. The *Swallow's* paying off is a good omen, for recently it has been the practice to send all ships to Chatham to pay off, and the *Garnet* and *Pylades* were cases which created great discontent. True we had the *Cleopatra*, but that was taking a Devonport ship. There must have been a goodly number of men in the Reserve, since, in spite of the number of pennants hoisted, the work of the gunnery school here has been going on just the same all through the manœuvres, and apparently there are plenty of men to spare. The return of the mobilized vessels has made things a little more lively.

The "Powerful" and "Terrible."

These two fine cruisers are now at Portsmouth preparing for the trials which have been so anxiously awaited by all naval officers, architects, and engineers. The preliminary trials of the *Powerful*, which was built at Barrow, took place on July 15th, on a course in the Irish Sea, when a speed of 19.5 knots was attained on a six hours' run, without pressing the boilers or exerting the full power of the engines, which have ultimately to achieve a speed of 22 knots. During this unofficial trial the machinery was worked slowly up to 95 revolutions with all the 48 boilers in use. In the evening after the trial the ship left Liverpool, using at first only 16 boilers, and with 60 revolutions she ran at 13 knots. The next morning eight more boilers were lighted, the revolutions increased to 75 and the speed to 15·5 knots. The speed was then gradually slowed down, so that the ship should not reach Spithead before 9 a.m. on July 17th, at which time she arrived without any hitch of any kind, the engines working smoothly and easily. As a similar experience was that of the *Terrible*, it certainly looks as if the battle of the boilers, so far as these vessels are concerned, is to be decided in favour of the Admiralty, whose bold step will thus be shown to be justified. The *Terrible* has been put out of dock at Portsmouth, and the *Powerful* has taken her place, these vessels having to be sheathed and coppered for foreign service. The completion of the dock which has thus taken them in is a feather in the cap of the contractors, which must not be forgotten in connection with the vessels. It appears probable that they will be placed in commission as quickly as possible, a captain having been already appointed to the *Terrible*, and one nominated for the *Powerful*. Probably they will be at first attached to the Channel Squadron.

Pembroke Dockyard.

The manœuvres seldom pass without giving some extra work to this yard, as the smaller craft are generally exercised in close proximity to this port. This year Milford Haven was made the powerful headquarters of the Rescue Fleet, and during the preliminary cruise the torpedo-boat flotilla attached to that fleet was here for manœuvring purposes. Indeed, during the greater part of last month we had more ships in the Haven than we have seen for twelve months. With the little craft there are always small mishaps and defects, and a fair share of the repair of these fall to our people, although this year there have not been so many defects as usual. But the presence of the fleet made the place very lively, and the *Stormcock* was daily engaged in carrying provisions to the ships and generally took a few passengers along to see what was going on at the same time. It was expected that Vice-Admiral Seymour would inspect the dockyard, but apparently he was too busily engaged. He would have seen good progress with both the *Hannibal* and the *Andromeda*. The battleship which is now at Hobb's Point has had one of her turntables, which was built in this yard, lifted on board and secured in position, the other will soon follow, and so far there is every reason to believe the ship will be finished to date and be a credit to the yard. The *Andromeda* is growing quickly and hope still exists that she will be completed in the Haven. I hear that the officers of the fleet were much pleased to find the fair way buoyed, a work of some time and nicety, but making it much more safe for large vessels to come up. While here the battleships lay in a single line with the flagship about a mile from Old Milford, and the cruisers and gunboats further up. The *Phæton* and the flotilla of torpedo-boats came close up to Pembroke. The advantage of providing coaling wharves alongside which the ships might coal on occasion, has been again pointed out on this visit.

Coaling Warships.

During the manœuvres some interesting statistics were published by various representatives of the press afloat in connection with coaling and the expenditure of coal in certain warships. The business of taking coal on board with celerity is now more thought about than formerly, and certainly needs every consideration, for much might depend in war time upon the promptness with which a ship could refill her bunkers. The record time at present is 115 tons an hour, achieved by the *Trafalgar* in the Mediterranean. The ships of the Channel Squadron are said to make an average of 100 tons an hour, 109 tons being the record in that squadron. In the Rescue Squadron recently the *Alexandra* took in 167 tons in five hours, which, in the circumstances, may be considered fair time working only one lighter. The same correspondents give the consumption of coal in one working day and for one week respectively in the following vessels:—

Name.	24 hours.		7 days.	Name.	24 hours.		7 days.
Alexandra	24·14	..	143·18	Australia	19·4	..	159·0
Sultan	30·0	..	224·5	Terpsichore	17·18	..	162·0
Edinburgh	26·2	..	230·0	Iris	28·0	..	213·17
Colossus	22·0	..	225·0	Mersey	19·0	..	140·0
Benbow	21.18	..	196·0	Niger	14·19	..	42·16

More Torpedo-Boat Destroyers.

The Admiralty have placed orders for the building of 20 torpedo-boat destroyers in addition to the 27 now in course of construction. Messrs Thornycroft & Co. will build the *Albatross*, *Coquette*, *Cygnet*, and *Cynthia*, Messrs. Hawthorn, Leslie & Co., the *Bullfinch*, *Cheerful*, *Dove* and *Mermaid*; Messrs. J. & G. Thomson the *Arab* and *Kestrel*; Messrs. Palmer's the *Fawn* and *Flirt*; Messrs. Doxford, the *Violet* and *Sylvia*; the Naval Construction Co., of Barrow, the *Leopard* and *Otter*; The Fairfield Co., the *Fairy* and *Osprey*; Messrs. Laird, of Birkenhead, the *Express* and *Flying Fish*. All these vessels are to have water-tube boilers and a speed of 30 knots.

The Belleville Boiler Abroad.

The step taken by our Admiralty in placing the Belleville boiler in our two largest cruisers has evidently created confidence in this boiler abroad, and it is being introduced in various foreign navies. Russia has accepted the system for the Imperial Yacht *Standart*, the cruiser *Rossia*, and two similar vessels of 11,000 tons displacement each. The *Svietlana*, another new ship, and also in the *Kherson* of the Volunteer Fleet where it has proved a great success. The Austrians are putting Belleville boilers in an armourclad, the *Buda Pest* [illegible] put them in the *Jose Garibaldi*, now purchased by [illegible] Government; the Chilians have [illegible] the Japanese for the new *Chiy*[illegible] in the French services, both [illegible] we find its greatest use and this after long experience. In the Navy the following ships are now fitted, or about to be fitted with his boiler: *Bremus*, *Bouvet*, *Charlemagne*, *Gaulois*, *St. Louis*, *Admiral Trehouart*, *Latouche*, *Tréville*, *Chanzy*, *Admiral Chevruer*, *Briux*, *Bugeaud*, *Pothuan*, *Alga*, *Descartes*, *Pascal*, *Galilée*, *Catinat*, *Lavosier*, *Protet*, and many smaller vessels. As in many of these vessels the results obtained have been excellent, it will be odd if its introduction into our Navy was not successful, and certainly all naval engineers appear to be of this opinion.

New Japanese Warships.

The England of the East, as Japan has been called, is evidently bent on becoming a great naval force. She can only win and hold her place by means of sea power, and that power she is evidently bent on possessing. With her energy, enterprise, resources and position, there is ample reason for believing that the attempt will merit success if not achieve it. The announcement that a big naval programme has been authorized set all the chief shipbuilders of Europe and America in a state of anxious expectancy, and not a few sent special agents to the Far East to look for contracts. There is cause for believing that British shipbuilders have not fared badly in respect to business, and probably our armour-plate and machinery manufacturers will also profit by Japan's determination. A statement is in circulation that fourteen warships, exclusive of torpedo boats and other small craft, are to be built for Japan, and that orders for twelve of these have been placed in this country, the remaining two going to America, while the torpedo boats are distributed, six to Germany and five to France. The other vessels are to be built at home, but orders for armament, armour, ammunition, machinery, materials and stores, will be placed chiefly in this country. The shipbuilding and allied trades should benefit largely, unless such suicidal troubles as have occurred on the Clyde and Thames take all the gilt off the gingerbread.

Trials of the "Santa Fe."

The *Santa Fe*, first of four torpedo-boat destroyers, which Messrs. Yarrow & Co. have in hand for the Argentine Republic, and launched on May 16th, underwent her official trials the first week in July. This boat differs from our destroyers in having ½-inch steel for the protection of the entire boiler and engine space. The length of the boat is 190 ft., with 19 ft. 6 in. beam, and a depth of 12 ft. Six Yarrow boilers of modified type with a new description of feed regulations, drive triple-expansion engines with 18 in., 26 in., and 39·5 in. diameter, and 18 in. stroke. These were intended to give a speed of twenty-six knots, but with a load of thirty-five tons on board half a knot in excess was realized, calculated as mean speed of a three hours' run with 1¼ in. air pressure in the stokehold. The armament of the *Sante Fe* consists of three 18 in. torpedo tubes, one 14-pounder and three 6-pounder quick-firing guns, and two Maxim machine guns. On the occasion of the trial the purchasing Government was represented in the boat by Commander A. M. Diaz, Lieutenants J. Grierson and H. Barbara, with Mr. T. W. R. Hughes, who is the consulting engineer to the Argentine Republic in this country.

U.S. Naval Administration.

Assistant Secretary McAdoo, of the United States Naval Department, at the opening of the Naval War College, dealt with the important matter of naval administration. An efficient system and a good navy, he said, were most necessary in a Republic "where war is apt to be more sudden and precipitate than under the most autocratic of monarchies, and which finds itself forced to assume great international responsibilities and obligations." He took Sir Vesey Hamilton's recent volume on "Naval Administration" as his text book to illustrate the many advantages of our system as compared with that which exists in the United States. The anomalous position of the head of the United States Navy department, a civilian, possibly quite untrained in the military art, almost surely without naval education, placed in direct entire and unquestioned control of a military organization, hedged about with most technical and difficult questions, was accepted by him as a necessity of free Government; but Mr. Mc Adoo, with our Board system as explained by Sir Vesey Hamilton before him, raised the question whether a single officer such as the chief of material, or an advising board representing all branches of the service, should not always be at the secretary's call. He wished to place at the disposal of the civilian head the highest professional ability of the Navy, and to put those competent to give it in the most confidential and responsible positions towards him.

THE "PERFECT" STAIR-TREAD.

AN improved form of non-slipping stair-tread, introduced by the "Perfect" Stair-Tread and Flooring Co., of Cheetham Street, Rochdale, has been brought under our notice as being specially suitable for use on ships and yachts.

These treads are made from a special alloy, composed chiefly of lead, with hard metal spiked plates inserted on the under side by a patent process, and thus there are no loose parts to become detached, and as the arrangement is such as to render each tread self-draining, no moisture or damp can accumulate, hence the treads will not rot or corrode.

Lead, admittedly the best non-slipping medium, when used in the form of rolled sheet, as a stair covering, is quickly displaced or torn by the hammering action of the feet. In treads manufactured in accordance with this company's patents the endurance of the lead is greatly enhanced, while a successful resistance to the hammering action is furnished by means of a number of flat spikes (of which there are some 18 per square inch) projecting nearly through the tread, the spikes also adding to the durability and non-slipping properties of the treads.

These treads are readily adaptable to any stairs, are easily laid, and do not require any skilled labour to fix them.

THE SUMMER MEETING OF THE INSTITUTION OF NAVAL ARCHITECTS IN GERMANY.

OWING to pressure on our space we were compelled to hold over from our last issue the report of the papers read (and the discussion thereon) during the summer meeting in Germany.

We now have pleasure in giving an abstract of these (the paper by Herr A. Dietrich being given in full) in the order they were read, and accompanied by such notes, taken during the meetings, as are likely to prove of interest to our readers.

The first paper, which was read by the Secretary, was one by Herr F. Andreas Meyer, Engineer in Chief to the City of Hamburg, on "The Maritime Position and Principal Features of the Port of Hamburg."

This most interesting paper was purely local in its character, and does not call for repetition in our columns. After a few remarks from Mr. Brown and Sir E. J. Reed the President proposed a vote of thanks to the author, which was carried in the usual manner, and to which Herr Meyer briefly replied.

Shipbuilding in Germany.

The second paper read before the members in Hamburg was one by Herr C. F. Laeisz, Chairman of the Hamburg Chamber of Commerce, and bearing the above title.

The author commenced his paper with the assumption that a brief survey of the development of the shipbuilding industry in Germany would not be unwelcome in the present stage of the proceedings, and in continuation said, in the times of wooden sailing vessels shipbuilding in this country had attained to a considerable degree of excellence, many a fine clipper ship having been launched from German yards. Since, however, wood was superseded by iron, and an ever-increasing portion of the world's carrying trade fell to the share of steamers, the natural resources Great Britain possesses in her enormous mineral wealth close to the sea, allied to her great capital and wonderful enterprise, have assured her an ascendancy in this as in many other industries which other countries have found it extremely difficult to keep pace with. It is thus we lagged behind very considerably, and not until Great Britain had accumulated an enormous tonnage of iron steamers and sailing vessels were the first efforts of our yards crowned with success. They have laboured and still labour under considerable disadvantages in the competition with British shipbuilders. Although labour is cheaper in this country, that advantage is outweighed by the higher cost of material and coal, owing to the greater distance from the pits and by the comparative scarcity of work which does not allow of skilled men finding ample employment and thereby working much more actively. The restrictions our laws impose on the employment of juvenile labour also stand in the way of creating a race of skilled workers, and the contributions to accidents insurance and old age pension funds obligatory upon employers are a heavy burden. Since the growing trade of the country has enabled our shipowners to materially increase their tonnage, and particularly since the Imperial Admiralty has given constant employment to a number of yards, our shipbuilders have been in a position to turn their attention to the highest class of work, enabling them to rank with the best of their profession. The tonnage they are turning out is, of course, small as compared with the enormous figures shown by British statistics; in point of quality, however, some of the craft "made in Germany" may be well worthy of your notice. I cannot here dwell on the various stages of Admiralty work, but confine myself to specimens of our merchant navy. In its development we have mostly followed in the wake of British enterprise; here and there, we have shot ahead, although you have not suffered us long to retain a front seat. When the ocean greyhounds came into fashion in the North American trade, the North German Lloyd were among the first to put a number of high-speed vessels on that line, and they have for a considerable time had more steamers of that class running than all other lines put together. The first half dozen were built at Fairfield, the later editions at the Vulcan Yard, Stettin, where a steamer is just now building for the same owners, which is to vie with the famous Cunard flyers. Her dimensions are:—625 ft. between perpendiculars; 66 ft. beam; and 43 ft. moulded depth; while her twin engines are to develop 28,000 H.P. The company have another boat of similar properties building at Dantzic, by Mr. Scichau, who has supplied a couple of mail steamers for their Eastern service. The Hamburg-American Line were among the first to introduce twin-screws in ocean steamers, and one of them, the *Furst Bismarck*, has, I trust, merited your approval as a fair specimen of German shipbuilding and engineering skill.

She and another of her type were built by the Vulcan yard, while two sister ships were supplied by Messrs. Laird Brothers and the Fairfield yard. The same owners have also taken to twin-screws in their large cargo boats, some of which were built by the Vulcan yard and by Messrs. Blohm & Voss, and they have at present a huge steamer of that description building by Messrs. Harland & Wolff, which is destined, until you go one better, to rank as the biggest carrier, her deadweight capacity being over 12,000 tons. Her dimensions are:—560 ft. by 62 ft. by 41 ft. You will have occasion to inspect the yard just referred to—of Messrs. Blohm & Voss in this city—and I think you will find it admirably situated and well laid out, and fitted with machinery to produce excellent work. At the same yard you will find, in course of construction, a floating dry dock capable of lifting 17,000 tons, of which we are sorely in need, considering the great displacement of many of our new ships. At another yard close by, the Reiherstieg, you will find an off-shore dock, in which vessels are hauled in sideways, as there is not space to put them in end on. At each of these two yards there is a passenger steamer building for the East African mail service. Turning again to cargo-boats, the first steamers carrying oil in bulk were built for German owners by Sir. W. G. Armstrong, Mitchell & Co., who have supplied quite a fleet to the German-American Petroleum Co. and other owners. Latterly, some boats of this class were also built in German yards. The chance is that, in going over our yards, you will see one or two tankers repairing, as the strain upon their numerous bulkheads has proved the delight of the shipbuilder who has not built them. However, in this respect, as in every other, each succeeding production shows that the difficulties attending this description of vessel are being better contended with. Our attention has also been turned to the turret-deck ship, and there is now at Flensburg a so-called elliptical steamer building, which is expected to be an improvement upon the Sunderland type. The ordinary "ocean tramp," is a species that has prospered indifferently in this country, where I think she cannot be worked as economically as in England. Over and over again owners who began with tramp steamers have ended by finding them employment in some regular line, or they have been swallowed by the lines. It is probably due to this fact that our steamers show a co-efficient of fineness seldom over 0·76, and I know of scarcely a German steamer with as full lines as there are many of under the British flag, approaching or even exceeding 0·8. All improvements in the engine department have been closely followed in this country. The Kosmos Line, of Hamburg, for instance, were among the first who adopted quadruple-expansion engines of Messrs. Wigham, Richardson & Co.'s pattern, and since hydraulic riveting permits of subjecting boilers to high pressure with safety, several of our engine works have turned out quadruple engines that have given the utmost satisfaction. You are, of course, familiar with the plan devised by our colleague, Mr. Schlick, of balancing engines, so as to materially diminish vibration. The paper he read upon the subject before this Institution two years ago, has met with much approval, and his name, allied to that of some eminent English engineers, has gained the Yarrow, Schlick, and Tweedy System marked success in your country as well as in France and Germany. Forced draught, on the other hand, is not much believed in in this country, and some of its devotees have been cured of their partiality at their own expense. Perhaps ill-luck in the beginning has deprived us of the courage to go in for the right system and give it a fair trial. Sailing shipowners in this country have long clung to wood, and their reluctance to go in for iron was not overcome until builders proved capable of turning out iron vessels that were as fast sailers as our old wooden clippers, and required very little ballast. In the last 20 years, however, a number of very fine sailing ships have been built in German yards, and some of them have made record passages, namely, the *Preussen*, steel ship, built by Blohm & Voss, Iquique to Hamburg, 71 days; *Luna*, iron barque, built by the Germania Yard, Rangoon to Falmouth, 92 days; *Hebe*, steel four-masted barque, built by Blohm & Voss, Channel to Adelaide, 69 days. The last-named vessel covered 13,485 nautical miles at an average speed of 8·14 miles per hour. Mr. John C. Tecklenborg, of Geestemunde, built last year a steel five-masted barque, the *Potosi*, which is at present the largest sailing vessel afloat. Her dimensions are, 360 ft. between perpendiculars; 49½ ft. beam; 31 ft. moulded depth, and 4,026 register tons; she carries 6,200 tons deadweight, displaces 8,470 tons on 25 ft. draught, and spreads 50,020 square feet of canvas. She is a very fast sailer, a most comfortable ship at sea, and tacks with ease. The heavy strains large vessels have to undergo when heavily laden has shown the advisability of strengthening them beyond Lloyd's rules; bulkheads close to every full-rigged mast have proved an excellent transverse strengthening, and a bridge-house amidships for about one-sixth of the vessel's length adds largely to her structural strength, gives her considerable reserve buoyancy, and prevents her decks being swamped fore and aft. Few of our sailing vessels are fitted with water ballast, not so much from technical as from economical reasons; where such has been fitted deep tanks have proved decidedly preferable to the double bottom, which is apt to raise the centre of gravity to a dangerous point if the vessel is loaded with a homogeneous cargo. Very few German owners had confidence in composite vessels, and the number of them built in this country is consequently exceedingly small. Steel was readily adopted as a shipbuilding material, the more so as it was produced here in excellent quality, and, for a few years, at a comparatively lower price than in England. Latterly, our steel makers have found it impossible to compete with the British material, which can be laid down cheaper at any German port than the home-made article which has to pay carriage over a long distance. No duties are imposed on any shipbuilding material, nor on coal, just as there is no difference in the harbour dues, or any other impost, between a German and a foreign ship. I should like to correct an error frequently met with in English papers, that is the belief that our merchant navy is largely subsidised by the Government. With the exception of two mail subsidies (one of £200,000 yearly for the Eastern and Australian service, another of £44,000 for an East African line), there are no subventions, or privileges in favour of ships built or owned in this country over those of other nationalities. Legislation, which is doing so much in certain countries to hamper enterprise, has not quite spared us, but it has been satisfied to let shipowners look after themselves, provided they do everything [illegible] render navigation as safe as possible, and indemnify sailors for any accidents at sea, and their widows and children. A Mutual Accident Insurance Association, to contribute to which is compulsory on every German shipowner, has to assess the pensions fixed by law, and to levy the yearly contributions; and, as it has thus become the joint interest of shipowners to prevent accidents, the association is empowered to enforce whatever it deems imperative for the safety of life and limb on board ship. Its regulations embody, therefore, a great many things provided for by the English Life-Saving Appliances and other Acts, and its surveyors are fulfilling the duties of the Board of Trade officials in your country. We have not yet seen the wisdom of imitating the English Load Line Act, but we have our bulkhead committee pondering on the solution of the problem of rendering our ships unsinkable.

Mr. Martell, in opening the discussion, said that he should not like a paper like this to pass without expressing his admiration for Herr Laeisz, and for the information he has afforded us since we have been in this country. It is stated in the paper that German shipbuilders labour under considerable disadvantages as compared with shipbuilders in Great Britain. That is true to a certain extent, but not altogether in the present day, because from what we noticed yesterday they appear to have a great many advantages as compared with British shipbuilders. In the first place, the works they have laid out are new, and they have been able to adopt most modern machines to do their work, whereas British shipbuilders, having built up their places, and not caring to condemn all their old machines, have a great many which are not capable of competing with the most modern ones. That is one advantage, and a most considerable one. In the next place, although coals are somewhat dearer, the diminished cost of bringing coals to shipyards here reduces that advantage to a minimum, whereas the lower wages paid and the greater number of hours worked certainly create a great source of advantage to German as compared with British shipbuilders. The author has called attention to the quality of the workmanship in the German-built ships, but he has not quite gone the right way about it. I am sorry to disapprove of it, and, coming here as visitors in the *Furst Bismarck*, and being treated in the manner we were, it is not fair to say anything in disparagement of it. We had an opportunity yesterday of seeing those magnificent works, unrivalled for shipbuilding and engineering, and of witnessing the splendid manner in which the works are carried on, and the very excellent work which is done there. The speaker, referring to a stern frame and casting, wondered where they were produced, having forgotten for the moment the name of Krupp. It is a magnificent piece of work, and altogether the workmanship we had an opportunity of witnessing will enable us to confirm Herr Laeisz's remark that no better workmanship could be witnessed anywhere than that which we have seen in Hamburg. With regard to tank steamers, there will be something more said about them on another day by Herr Schlick, so the speaker only briefly alluded to the subject. Although Herr Laeisz says "the chance is that in going over our yards you will see one or two tankers repairing, as the strain upon their numerous bulkheads has proved the delight of the shipbuilder who has not built them," I must say with regard to some of the early boats which were built, we did not realise the great amount of strain as compared with vessels loaded with dry goods that could not shift. With regard to the recent ships built, they are now doing their work in a satisfactory manner, and this bulkhead question will not arise in the modern ships built for oil-carrying purposes. Mr. Martell was rather surprised to see the opinion expressed that ocean tramps cannot be worked so economically and successfully in this country as in England. That is very surprising, because with regard to a great many of such ships British owners find it impossible to sail them with any advantage, and have had to lay them up rather than run them, because they would only lose money on them. We are told they are run by German shipowners, and we are told that they realise a very excellent return for the money paid for them. That results from two or three causes. One is this: I believe that although German sailors are not paid so highly as British seamen, they are certainly better handled, they are under better discipline, and do their work better. In the next place, they are steadier and more sober men, and attend more to their duties than the British sailor. Now, another and a very great consideration is the wisdom of the German people in not adopting the British load-line—that is, from an economical point of view. It must be very evident to everybody that when German shipowners are allowed to load their ships down to any depth they think proper, that they must pay better, and that is a very important consideration in the matter. There is a point one cannot help remarking upon with regard to the great boldness that the German shipowners display. They are going in for larger ships, in fact, than we have built, and it is contemplated to build ships even larger. There is a ship being built at the present time for German owners to carry 14,000 tons deadweight. A few years ago we could not have realised such a thing. With regard to the advisability of strengthening ships beyond the requirements of Lloyd's rules, the speaker protested against it emphatically, and said that from his experience within the last two or three years very large ships have been built, and on their first voyage on reaching a foreign port they have been pronounced to be strained and some of them leaky, and additional strength has been put into them. He, Mr. Martell, never believed in the necessity for it, and insisted on the return of those ships to the United Kingdom, that they should be surveyed by most competent surveyors, in order that they should report upon them as to the necessity of doing what was done. Although there were six or eight ships of the largest size on their return for survey, there was not a single instance where the surveyors had reported that there was any sign of weakness in those ships, or any hint of those strains from the insufficiency of the scantlings of the ship. It is so very easy to make observations of that description when ships have been increased as largely as they have been. When the owners of small ships have heard of the loss of a large ship at sea, they have shaken their heads and said, "Ah! I said so. I knew you could not build them strong enough; they were sure to break down, and in large ships like that you cannot put sufficient strength." The speaker distinctly wished to maintain that if a ship is built to the requirements of Lloyd's rules, efficiently surveyed, and the workmanship done in an efficient manner, and properly handled by being properly stowed, that there is no fear whatever of any accident occurring on account of weakness in those ships, and was glad to have the opportunity of saying this, because he would be sorry that such an opinion as that should go abroad, as it would be very misleading.

Sir Wm. White quite agreed with all that Mr. Martell had said about the magnificence and efficiency of the great establishment which they had yesterday the privilege of viewing. Sir William understood from Herr Voss, that in this matter the German character has appeared in a remarkable way, and that while the proprietors have indicated quite clearly their requirements and what they wished to be done, they went to a learned professor to give effect to those requirements, and the result is that in those engine-works, as well as in the shipyard, you see the most wonderful arrangement for carrying on the work economically and speedily. We could not help feeling that Mr. Martell touched upon another important point when he said that it was an advantage in all industrial enterprises to come after. There are some in this hall who think they have not been born just at the right time. Messrs. Blohm and Voss were born about the right time, because they were born about the time to come to England and study there all we could teach them, and then come back to Germany, not merely to adopt, but to improve upon what they had learned. I may, as an Englishman, say that the principal promoters have been men who learned much in our country, and who are proud to acknowledge that they there learnt the elements of the business which they are carrying on with such great success. Of course there is a melancholy satisfaction in having apt pupils. It was my fortune to be a teacher for many years of pupils from all parts of the world. One sees his pupils outstripping him in the race of life, doing professional work of a still higher character. We are proud of our pupils, but still as we grow older we feel that we could wish we had been born a little later, and had been the pupil of somebody else. I should like to say a word about the question of relative cost. Herr Laeisz has said that labour is cheaper in Germany but materials are dearer; but with that excellent judgment which characterises all we see here, I find on another page that when British material is cheaper the German shipbuilder does not hesitate to go to Britain. Whether the steel makers of Great Britain are making such good business as the German buyer, of course, does not concern the German buyer, but the German buyer is sensible enough to combine the cheapest labour with the cheapest material, therefore his product must be cheaper.

(To be continued.)

NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from June 25th to July 27th, 1896:—

Brown, Walter, chief engineer to the *Melampus*, to date July 15th.

Couper, J. A., fleet engineer, has been placed on the Retired List, with permission to assume the rank of inspector of machinery.

Donohue, R. W., engineer, has been placed on the Retired List of his rank.

Fricker, Elijah, fleet engineer to the *Victoria and Albert*, to date July 14th.

Gaudin, Edouard, engineer to the *President*, additional for the *Albatross*, to date July 6th.

Goldsmith, Henry C., fleet engineer to the *Victory*, additional for the *Calliope*, to date June 26th.

Haddy, George A., fleet engineer to the *Vivid*, additional for the *Raleigh*, to date July 6th.

Hamm, Richard S., fleet engineer to the *Pembroke*, additional for the *Endymion*, to date June 28th.

Jackson, Thomas P., engineer to the *Victory*, to be lent to the *Hunter*, for the manœuvres, to date July 8th.

Jordan, C. F., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Lee, R. S., fleet engineer, has been placed on the Retired List, with permission to assume the rank of inspector of machinery.

Nicholls, Harry E., (probationary) assistant engineer to the *Victory*, to date July 10th.

Pethick, Ernest E., assistant engineer to the *Edinburgh*, additional, lent for the manœuvres, to date July 8th.

Reynolds, Thomas R., engineer to the *Victory*, for the *Charger*, to date July 11th.

Sheen, Charles C., assistant engineer to Torpedo Boat No. 81, in charge of machinery during the manœuvres, to date July 8th.

Simmons, George T., staff engineer to the *Pembroke*, additional for the *Arethusa*, to date day after paying off of the *Arethusa*.

Thomsett, F. D., engineer to the *Vivid*, additional for the *Opossum*, to date July 11th.

Toman, Richard W., engineer to the *Brillian* lent), to date July 8th.

HOAR & BROWN'S HARDWOOD MARKET REPORT, JULY 22nd, 1896.

Teak.—	Logs. Loads.	Planks. Loads.	Blocks. Loads.	Total. Loads.
Stock, 1st July	6,309	2,517	65	8,891
Landings	1,180	542	63	1,785
	7,489	3,059	128	10,676
Deliveries	468	115	7	590
Stock, 17th July	7,021	2,944	121	10,086

The market still continues very firm for fresh wood. There remain several hundred loads of old stock offered at low figures, which will, no doubt, soon go into consumption, as the price asked is about three pounds per load under that quoted for the new arrivals. General business cannot be pronounced brisk, but the effect of the short forward supplies is to maintain prices, and shippers are asking increased values for forward deliveries.

Planks are not going off so readily, the market after the recent expansion has ceased to show any further excitement, and trade has become dull.

Mahogany.—The great scarcity of genuine timber has driven the market still higher. Stocks are now very short, and the attention of buyers is diverted towards other classes which nearly approach the genuine article, such as Paraguay, Panama, African and Cisparta, all of which are being sold at about 25 per cent. under the price for equal sizes of Tobasco or Honduras.

Of Cuba there is an ample supply of small and medium sizes, but larger wood is scarce and commands heavy figures.

Walnut.—Logs have declined in value, and stocks are increasing again. Lumber is selling fairly well.

Whitewood.—Logs have not been finding ready purchasers, and considerable quantities may be expected to go without reserve at low figures.

Oak.—The demand for inch boards has increased, as shown by the large consignments lately arrived to order.

Kawrie Pine.—Shipments are realising a slightly increased price, as the demand abroad appears to be great, and importers intend still further to raise the price of future consignments.

Greenheart.—After many years of dormant trade, a demand for this timber has now become apparent. The price has advanced all round, and trade is expected to become active and continue so for some time, as several contracts require filling for work in hand.

Sequoia.—Stocks have diminishad remarkably, and prices for the small remaining lots are said to be firm.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(From our own Correspondent.)

July being the month for the annual "Fair Holidays," which were held from the 16th, until in most cases the 27th, all the Clyde shipbuilding yards and engineering works suspended operations. As is customary, extra efforts were put forth by various builders to bring work on their vessels to a definite stage before the cessation for the holidays, and a good many important launches took place immediately prior to the stoppage.

The present bright prospects of the shipbuilding industry have imparted a decided zest to the holidays, which has shown itself in a more than usually heavy exodus of people from the Clydeside burghs, both by rail and steamer.

The Arbroath district committee of the Amalgamated Society of Engineers held a meeting on July 14th, when it was reported that Mr. Ferguson, the organising district delegate, had made a temporary arrangement with the employers regarding the overtime question, until a uniform rate for overtime can be fixed in the district. The meeting approved of the temporary arrangement, and a strike has thus been averted.

The Airdrie engineers have arrived at a satisfactory settlement, so that for the present the dispute is at an end. The men say that the strike has been the means of strengthening the Airdrie branch of the society, and it is expected that the working conditions will be considerably improved.

Messrs. The Grangemouth Dockyard Co. have received an order to renew the woodwork of the gunboat *El Presedenta*, and fit up barbettes, and also to fit a set of triple-expansion engines of modern type from the Government of San Domingo. The vessel, when completed, will be a modern man-of-war with eight guns, two being placed forward, two aft, and the other four in the barbettes. Messrs. Hutson & Son, Glasgow, will supply the engines.

Mr. Thomas Orr, jun., boatbuilder, Greenock, has just built to the order of Messrs. Hanna, Donald & Wilson, Paisley, who will themselves supply the engines, a fine steam launch. Mr. Orr has also completed for Mr. W. A. Coats, *Queen of the May*, a motor launch, and also for the same owner a centre-board sailing boat.

Messrs. Mackie & Thomson, shipbuilders, Govan, have booked contracts for over forty steam trawlers.

Messrs. William Denny & Brothers, shipbuilders, Dumbarton, have secured from the Union Steamship Co., Limited, an order to build a large cargo and passenger steamer for their intercolonial trade; they have already a vessel under construction for the same company.

Messrs. A. M'Millan & Son, shipbuilders, Dumbarton, have received a contract from the Union Steamship Co., Limited, to build a large cargo and passenger steamer for their inter-colonial trade, Messrs. Denny & Co. supplying the machinery. Both this vessel and the one being built for the same company by Messrs. Wm. Denny & Brothers are to be constructed to the classification of the British Corporation Registry, and under the superintendence of Mr. John Darling, acting for the Union Co.

Messrs. Fleming & Ferguson, shipbuilders, Paisley, have contracted to build for the Cork Harbour Commissioners two steel hopper barges. These vessels are to be built to the specification of Mr. J. Price, engineer to the Cork Harbour Commissioners, and they are to be classed with the British Corporation Registry.

Messrs. A. Rodger & Co., shipbuilders, Port-Glasgow, are building for the Glen Shipping Co. a barque of 1,400 tons register, to carry 2,800 tons deadweight; the vessel is to replace one of the Glen liners, lost at sea some months ago.

Messrs. Chambers Brothers, boatbuilders, Greenock, have lately secured an order to supply a dozen collapsible boats to be built of teak wood, for use in Russian warships at Sebastopol.

Messrs. The Fairfield Shipbuilding and Engineering Co., Govan, are building three 30-knot torpedo boat destroyers, to be named *Gipsy*, *Osprey*, and *Fairy*, respectively.

Messrs. Carmichael, M'Lean & Co., shipbuilders, Greenock, have secured an order to build a first-class screw steamer, of about 200 ft. in length, for Continental owners, and will probably be engined at Greenock.

Messrs. The Ailsa Shipbuilding Co. have received an order for another steam yacht, for an American gentleman, designed by Mr. G. L. Watson; they have also booked an order for a steamer from the British India Co., and a small vessel for the fish-carrying trade, from Mr. O'Brien.

Messrs. Scott & Sons, shipbuilders, Bowling, have received an order for a screw steamer of about 150 ft. in length, for local owners.

Messrs. Simons & Co., shipbuilders, Renfrew, are to supply for the East London Harbour Board a dredger of 1,000 tons capacity.

Messrs. The Steel Co. of Scotland, have lately completed the casting of a steel stern frame for a steamer of about 5,000 tons, to be built in Japan.

The shipbuilding firm of Messrs. Samuel M'Knight & Co., Ayr, which for many years past has leased from the town authorities the shipyard, in connection with which there is one of the most modern and powerful hauling-up slips in the Clyde district, has lately been formed into a limited liability concern. Mr. Peter Taylor, until recently manager with Messrs. A. Rodger & Co., Port-Glasgow, is to fill the post of managing director. The order for a steel screw cargo steamer of fair dimensions has recently been booked, and lately the speed trials took place of a swift saloon paddle-passenger steamer of 230 ft. length, which the firm has completed for the Bristol Channel passenger service. Three speedy vessels produced by the same firm are already doing good service on these waters, and the boat now about to be added—the *Britannia*—attained on her trials the high average speed of 19 knots over a whole day's steaming. The vessel has been engined by Messrs. Hutson & Son, of Kelvinhaugh Engine Works, Glasgow, and in this department the leading feature is the boiler, which is of the high pressure "hay-stack" pattern.

The work of repairing the graving dock at Port-Glasgow is being attended by difficulties which were unforeseen. In order to deal with a leakage at the entrance gates, which had prevailed for some time and to a considerable extent, the Harbour Trust resolved to erect a coffer dam across the entrance to the dock, so that the water might be pumped out and the causes of the leakage ascertained. The offer of Mr. Lawson, contractor, Rutherglen, of £350 to erect a dam of wood piling of sufficient stability to keep the enclosure water-tight was accepted. This part of the work has been completed, but a serious leakage near to the east portion of the piling has occurred, and so great is the inflow of water from this quarter that the pumping engines have to be kept constantly going to cope with it. The Trust met in conference with two civil engineers, Messrs. Macalister & Crawford, Greenock, for the purpose of eliciting the best means of stopping the leakage, and upon whom the responsibility rests of doing so. Until this has been effectually done the necessary repairs cannot be proceeded with.

Clyde builders have sent in tenders for the construction of two first-class battleships for the British Navy. They are to measure 390 ft. in length, with a beam of 74 ft., and a displacement of 12,900 tons. Steam is to be furnished from Belleville water-tube boilers, and their speed is to exceed that of the *Majestic* class of battleship by at least half a knot.

New Battleships.—The order for two battleships comprised in the Government's naval programme have been placed, one with the Thames Iron Works, and the other with Messrs. Laird, of Birkenhead. Both of the new ships will be 390 ft. long and 74 ft. beam, with a displacement of 12,950 tons. There will be 20 Belleville boilers.

TRADE NOTES FROM THE TYNE, WEAR, TEES, HARTLEPOOLS, &c.

(From our own Correspondent.)

THE TYNE.

Shipbuilding.—Though the seventh month of the year has reached its end, and some fifteen weeks have elapsed since the concession of a general wages advance to the operatives seemed to herald the advent of a lively time in shipbuilding, nothing sensational has yet taken place in the way of improved business. There are, of course, certain establishments kept busy on Government work, and a number of others are kept briskly engaged on vessels for special services; but there can be no manner of doubt that the work in progress for purposes of general commerce, or oversea transport of commodities is meagre enough, and that in consequence a good many building berths in the ports of the north-east coast continue to be occupied with piles of material, instead of ships in process of construction. The present condition of the shipbuilding trade cannot be described as uniformly brisk, and it would be equally inconsistent with the facts to say that any considerable degree of slackness existed, excepting in special instances. The extremes of briskness and inaction in shipbuilding yards are, however, to be met with on all the Northern rivers, and the strange phenomenon of overflowing work in some establishments, almost side by side with desolation and emptiness in others may well suggest matter for reflection. If the cargo-carrying trade were now in a flourishing condition, there is every reason to believe that the long looked for but still delayed "boom" in shipbuilding would by this time have manifested itself; with the result that not a fortunate minority, but the whole of the yards in the North-Eastern district would have their berths filled and their shops resounding with work. That the shipping trade is still unprosperous, however, is brought directly home to managing owners by the difficulty of fixing ships for any kind of service at remunerative rates, and to shareholders the fact is made clear by continued absence of dividends. Even for the shipping trade, however, there appears to be some promise of improvement in the early future, as symptoms of strengthening business have presented themselves in other departments of trade, becoming more strongly marked in the second, than in the first quarter of the year. It may fairly be presumed that such a general improvement as that indicated must eventually react on shipping, and with fuller employment for existing ships there will come, it is to be hoped, a more active demand for new ones.

Messrs. Armstrong, Mitchell & Co. have now practically nothing on the stocks, either at the Elswick or Low Walker yards, but warships, and at both establishments very active progress is being made with the work in hand. It is understood that an additional order for a large cruiser has just been booked by the firm, on foreign account; making in all some dozen war vessels to be built and delivered by the end of 1897. Some important additions have recently been made to the plant of the Elswick establishment, and every effort is being put forth to keep the machinery equipment thoroughly up to date. At the Low Walker yard new additions have also been made to plant and machinery, and it is not too much to say that in the latter respect the yard has been completely remodelled within the past half dozen years.

Messrs. Wigham Richardson have booked several important orders lately, among which may be mentioned one for a fast passenger steamer, to be added to the fleet of the Carron Co., of Leith, for whom the firm have previously built vessels that have proved entirely satisfactory in work. The firm have also an order from a Liverpool firm, besides some from foreign owners for light draught passenger steamers. The most recent order booked by the firm is from Japanese owners, and includes two vessels for coasting purposes, each of which is to be over 200 ft. in length, and capable of carrying about 1,000 tons of cargo.

Messrs. Hawthorn, Leslie & Co., very recently launched a vessel of exceptionally large capacity, which is intended for the colonial meat trade, and have on the stocks two other vessels of similar size, design, and equipment, for the same service. The firm are engaged in fitting out for sea two or three handsomely designed vessels, ordered by Russian owners, and it is understood that they have some further work to proceed with, though it is, as yet, in the preparatory stages. Messrs. William Dobson & Co. have three vessels on the stocks, and, though no particular activity at present exists in the yard, the future outlook has improved. The whole of the berths are empty at Messrs. Wood & Skinner's yard; but it is rumoured that the firm have recently booked an order, and some amount of confirmation is given to this by the fact that an alteration is being made in the arrangement of the berths.

The state of business at Messrs. C. S. Swan & Hunter's yard continues to be extremely satisfactory, if such an inference may be drawn from the abundance and importance of the work in hand. These are the principal, if not the only conditions from which the position of a firm may be gauged by an outsider, and if these constitute a sufficient criterion upon which to found an opinion, then the firm, to whom these remarks are intended to apply, must be looked upon as among the most successful and prosperous in the North. The firm are at present fitting out a couple of handsome vessels in the water, and another, of exceptionally fine lines and large carrying capacity, will soon be removed from the stocks.

The report is current that the Palmer Co. have been asked to tender for another large cruiser, and it is expected that this important order will be successfully negotiated. The company have their Howdon yard fully occupied with cruisers and torpedo destroyers; but there is plenty of room for a large warship in the Jarrow yard, and it is not at all improbable that the vacant space has been reserved to meet the contingency, which now seems imminent. There are two large merchant ships in frame at the company's Jarrow yard, and one nearly plated, while at the quay, several large vessels are receiving their final equipments. The Tyne Shipbuilding Co. have three large vessels on the stocks in the various stages of framing, plating, and finishing.

The Edwards' yard, near the Northumberland Dock, has been re-opened after a somewhat prolonged stoppage. The work commenced upon consists of some small barges for harbour service, but it is expected that other work of a more important kind will soon be in evidence. Messrs. Readhead's yard still presents the appearance of general briskness that was apparent last month and for a long time previously, and in the initiatory departments pressure still exists, indicating the continuance of briskness for many months yet. Messrs. Eltringham have three small vessels on the stocks, and at other yards near the junction of sea and river work is fairly plentiful. Almost the whole of the graving docks at Shields are occupied with vessels undergoing painting or repair, and in one or two cases contracts of importance are in progress. The Smith's Dock Co. are carrying out extensive alterations with a view to further augment the productive capacity of the works, and the general convenience of the arrangements.

Engineering.—At the Elswick Ordnance and Engineering Works business has shown steady improvement since the opening of the year, and it is estimated that at the present time there are more men employed throughout the various shops of the great factory than at any former period. This is made all the more remarkable by the fact that through improvements in machinery the possible output of the shops has been vastly increased of late years, while the labour required for attendance has been reduced by some forty or fifty per cent. It must be kept in mind of course that extensions of premises have been going on unceasingly or such a result as is here stated would have been impossible. At the St. Peter's Engine Works a large meat ship, recently launched on the Tyne, is now receiving her machinery, and another vessel of equal size is expected shortly to be similarly fitted. The Neptune Works, Low Walker, are being kept very busy, there being in progress engines for eight or nine vessels. The engineering department of the Palmer Co.'s Works is also exceedingly busy, and other marine engineering establishments are, with one or two exceptions, well employed.

The works of the Combination Metallic Packing Co., Lombard Street, Newcastle, are at present very busy, a good many important orders in connection with the equipment of battleships and large steamers having lately come to hand. Messrs. Crosier, Stephens & Co., the well-known machinery agents, of 58, Collingwood Street, Newcastle, have issued a list of interesting marine specialities to be had from them, among which may be mentioned an improved ash hoist (Moore's patent), which is extremely simple in action, and has few working parts. It is automatically stopped at top and bottom, and has other distinctive features which must commend themselves to the practical engineer. There is also Moore's "Rapid" steam pump, elsh's sight lubricator, and an ingeniously devised water gauge protector, which is bound to increase in popularity as it becomes better known. The firm have long been agents for the sale of the well-known Meldrum's furnace, for burning cheap coal or other fuel of inferior quality. The patentees of the furnace are now introducing a special type for marine purposes, and Messrs. Crosier, Stephens & Co. have succeeded in getting the new type adopted on more than one steamer, the results in each case being fully equal to the expections formed. On a future occasion we hope to give full particulars of Meldrum's "marine type" furnace.

The works of Messrs. John Spencer & Sons, at Newburn, continue to be quite busy, among the recent products of the steel founding department being a cast steel stern frame, of a weight approximating to 16 tons. At the firm's Ouseburn works business is also active.

Messrs. George Angus & Co. continue to do a satisfactory business in marine engine specialities including rubber valves, washers, "Amianthus" and other packings, and in this as well as other departments of their works full activity is maintained.

Electric Lighting.—Messrs. J. H. Holmes & Co. have just now in hand several important ship-lighting contracts, as well as the fitting of a large installation for the North Eastern Railway Co., at Middlesbro'. The firm have also a number of contracts involving transmission arrangements. This, it may be stated, is a department of electrical engineering to which the firm have given particular attention, and are now making a speciality of. That there is abundant scope on ships of all kinds for the economical employment of electrical power is beyond question, and it is pretty certain that in a very short time most of the auxiliary machinery on steamers will be driven electrically.

THE WEAR.

Shipbuilding.—The Japanese syndicate, who placed an order for two boats to be built by Messrs. Wigham Richardson & Co., on the Tyne, have also placed an order for two vessels of moderate tonnage with Messrs. J. L. Thompson & Sons, North Sands, Monkwearmouth. The firm have on the stocks two good sized vessels, one of which will be launched immediately, and another, of exceptionally large dimensions, which is as yet in the framing stage. Messrs. Blumer & Co. have just commenced the construction of a large vessel ordered, it is said, by foreign owners, and have two others in advanced stages.

At Mr. Laing's yard sustained activity is to be noted in all departments, the pressure of work in the joiners' shop and saw-mills being most marked. For some time past the joiners, it would seem, have been refusing to work overtime, in spite of the fact that there were none of their members out of employment. In view, however, of the large amount of joiner work to be done on passenger vessels building in the yard the operatives have, we understand, now decided to work over each night when requested to do so, so as to present no obstacle to the completion of the vessels according to contract stipulations. The information has just reached us that the firm have received an order for a steamer of 11,000 carrying capacity, from the Anglo-American Oil Co.

Messrs. Wm. Doxford & Sons are still busily engaged in the building of turret ships, those at present on the stocks being all of large size. A commencement has been made with the construction of the two torpedo destroyers. At Messrs. Short Brothers' yard the frame turners are on night shift, which circumstance is indicative of more work for this department. The firm have begun to utilize the premises recently acquired by them at the east end of their yard, and have constructed a permanent gangway to communicate with ships placed alongside. This will prove a very great convenience to the firm, enabling them to fit out new steamers and repair old ones with much greater facility and despatch than formerly. The firm have not yet arranged to put down any vessels for building in the new ground; but it is well understood that they mean to do so whenever the building accommodation of their existing yard falls short of requirements.

Messrs. Osborne & Graham have resumed shipbuilding operations, after a lengthened stoppage; but as yet only a limited number of hands have found employment. Messrs. Priestman & Co. have on the stocks three vessels, one of which is the first example of the "self-trimmer" type, which is being introduced by the firm. This vessel, it is understood, will be launched in the course of a few weeks. The berths at Messrs. Pickersgill's yard are entirely vacant; but at Messrs. R. Thompson & Sons' yard there is more work in progress than at any time previously during the present year.

Messrs. Austin & Son have a fair amount of new work in hand and are very busy in the graving dock department. At the yard of Messrs. Bartram & Son, South Dock, business is dull, there being but one vessel on the stocks, and in the adjoining yard of the Sunderland Shipbuilding Co. quietude also exists. The large and admirably equipped graving docks owned by the Weir Commissioners are occupied with locally owned vessels undergoing repair.

Engineering.—We are pleased to be able to report that at the Palmer's Hill Engine Works (Messrs. John Dickinson & Sons) the orders in hand are numerous, among those recently booked being the engines, &c., for two Japanese steamers ordered from Messrs. J. L. Thompson & Sons. There is a night shift kept on in most of the departments, and in the pattern shops work is very brisk. There is also considerable activity in the boiler department, where boilers of quite exceptional size are now in course of construction. In addition to the large amount of new work in hand, the firm have also a number of repair contracts, and are just now being called upon to supply, in larger numbers than usual, crank shafts of the special type manufactured by the firm, and known as "Dickinson's patent."

At the North-Eastern Engine Works there are in course of construction several sets of engines for fishing vessels, besides engines for vessels of a larger type. It is understood that the management has recently succeeded in booking an important order for the supply of special machinery for land purposes, and in view of this addition to prospective work engagements, it is felt that the needs of the establishment for some time to come will be amply met.

The Southwick Engine Works are still well supplied with work, and at Messrs. Doxford's establishment a continuance of steady business may be noted. New premises of considerable extent are being erected by the Sunderland Forge Co., in contiguity to their existing premises, and a new and interesting development by this company is looked forward to. The frame-smiths of Sunderland are stated to have sent a formal notice to their employers for an advance in the wages rate, amounting to 12½ per cent., which they allege is the same as was taken off their prices in former years. This is, to say the least, a big demand; but doubtless, it will be modified, and a setlement will probably be arrived at on the basis of a much smaller advance.

Messrs. John Lynn & Co. continue to be well supplied with orders for steering gears, steam winches, &c., and the output of the last named speciality, during the present year, has, it may be added, been exceptionally large. In the local iron foundries business is very brisk, and brass foundries are kept going steadily. The output at the Monkwearmouth ironworks has been much larger in the last three months than in the corresponding period of any preceding year since 1891, and appearances indicate a continuance of the improved business for some time to come.

Increased imports of timber have brought about an improvement in the demand for unskilled labour at the docks, though it has not transpired that the supply has been even temporarily short of requirements. The general shipping trade of the port also shows improvement, a fact upon which the responsible local authority is to be congratulated.

The Hartlepools.—In the shipbuilding yards of this centre business is not so good as could be desired, but signs of fuller employment for both hands and machinery in the near future are not wanting, and we doubt not that by the end of the year a return to the normal state of business will have to be recorded. At the Central Marine Engine Works business is slack, though it may be noted that since June 5th five steamers engined at the works have had their trial trips. The last trial, that of the s.s. *Atlantic*, belonging to Messrs. Cockerline, of Hull, took place on July 11th, and was in the highest degree successful. The docks now present quite an animated appearance, owing to the daily increase in timber imports.

Stockton.—It is announced that Messrs. Ropner and Messrs. Richardson & Duck have recently booked orders, and that Messrs. Craig, Taylor, & Co. have also added to their prospective work engagements. The conditions for an early improvement in local trade are accordingly provided, and it is to be hoped that the improvement will be fully equal to anticipations. Bridge and boiler building establishments are well provided with work, and at the Stockton Forge and similar establishments the orders in hand are fairly plentiful.

Middlesbro'.—The shipbuilding yards continue to show a tolerably active state of business, Messrs. Raylton Dixon & Co. having most of their building berths occupied. Engineering establishments are on the whole well employed, whilst steel works generally exhibit a high state of activity.

Darlington. — The works of the Darlington Forge Co. continue to be kept busy, the demand for the company's specialities, both in steel castings and in steel and iron forgings, being well maintained.

Consett. — At the Consett Iron Co.'s Works activity is still to be noted throughout the various departments, and a satisfactory output of ship and boiler plates, angles, &c., is maintained. The dividend just declared by the directors shows the prosperous condition of the business.

THE MERSEY.

(From our own Correspondent.)

THE position generally continues satisfactory throughout this district, both as regards the shipbuilding and marine engineering industries, the principal firms being all well engaged, and some of the leading machine tool makers are exceptionally busy on heavy work for shipbuilding requirements. Quoting from a circular of a local firm of shipbrokers and contractors the present position as it affects the shipbuilding trade, so far as both owners and builders are concerned, is very well summed up in the statement that "the anticipated increase in wages in the shipbuilding and engineering trades at the commencement of the year, together with the probable rise in the cost of raw material and a slight spurt in freights, caused, as usual, a rush to order new boats, and some of the yards were filled with new orders for tramps and liners. These orders have now been nearly worked off, and if steamship owners will only content themselves with replacing such boats as are absolutely necessary for old-established and existing lines, we may hope to see that improvement in freights for which we have been waiting so long. It has been demonstrated beyond all measure that in long voyage trades it is only the newest and most modern type of steamer that can hold its own in the present days of excessive competition. The old and obsolete type of vessel must go to the wall, and for years past we have advised the realisation of such property. Large numbers have been sold to foreigners and others to be broken up, but many thousands of tons yet remain and must inevitably follow suit." The circular refers to the introduction of steam into the Californian trade; the starting of new lines of steamers by the Japanese in opposition to our old-established companies; the great strides made by Germany in the art of shipbuilding, as bound to tell on our own shipbuilding industry. Amongst the new features to be chronicled, the report adds that although quadruple-expansion engines are being fitted to some new boats, there was no marked inclination to adopt them generally.

Messrs. Laird Brothers, of Birkenhead, continue busy on work in hand, including a number of torpedo-boat destroyers, and new mail steamers, and during the month have launched from their yard the *Ulster*, one of the four twin-screw steamers for the cross-channel service between Kingston and Holyhead which the firm are building for the City of Dublin Steam Packet Co. The *Ulster* has a length over all of 372 ft.; breadth, moulded, 41 ft. 6 in.; depth at side to upper-deck, 29 ft. 3 in.; height from main to upper-deck, 8 ft. 8 in.; tonnage, 3,069; draught of water ready for service, 14 ft. 6 in.; speed, 23 knots. The hull is of steel, and there are ten watertight compartments. The machinery includes two independent sets of inverted direct-acting tri-compound engines, each set having one high, one intermediate, and two low-pressure cylinders. The air pumps are vertical, one to each set of engines, worked from the piston-rod crossheads. The propellers are of manganese bronze. There are four steel boilers, double-ended, each with six furnaces, and working pressure of 175 lbs., to be worked on the closed stokehold system, and there will be two funnels, two pole masts, and a turtleback 70 ft. long, forward, and a flush upper-deck, on which there will be three deck-houses—the machinery, it may be added, being entirely below deck and out of sight. The first-class dining saloon on the main deck is 40 ft. by 34 ft., extending the full width of the vessel, and the sleeping accommodation, state-rooms, ladies' cabins, saloons, and smoking-rooms are all arranged in a superior style. In the forward deck-house are the officers' rooms, two state-rooms and saloon galley. Ample space for the Post Office service is provided on the main deck forward of the first-class cabins. For ventilation the cabins generally are amply supplied with skylights, ports, and ventilator shafts, whilst the vitiated air is carried away through exhaust tubes led into the funnel casings. The lavatories are extensive and well fitted, plunge and shower bath with hot and cold shower service being also provided. The remaining three vessels, which are being rapidly pushed forward, are all to be built on the same lines as the *Ulster*.

In the general engineering trades, not only is the activity recently reported fully maintained, but an increasing quantity of new work comes forward, many of the leading establishments having orders in hand which will carry them over the rest of the year. Stationary engine builders, machine tool makers and boiler-makers are all busily engaged. Locomotive builders continue to book a considerable weight of new orders, whilst general engineers are all in a good position as regards work in hand.

The usual monthly returns of the engineering trades unions are again of a satisfactory character as regards the improving condition of trade, and consequent continued tendency to decrease in the unemployed list. The Amalgamated Society of Engineers has now only 2⅓ per cent. of the total membership on out-of-work support, which is slightly lower than last month's percentage, whilst in the Manchester district only 1⅔ per cent. of the local membership are receiving benefit, the number of unemployed having undergone a remarkable diminution during the last twelve months or so. In the Steam Engine Makers' Society there are only ⅔ per cent. of the total membership on donation. Reports as to the state of trade are generally marked by a buoyant tone, the position in many departments and districts being more satisfactory than for many years past. Practically all the returns indicate trade as good, or moderate, and the anticipations of improvement expressed in previous reports are evidently being fully realised.

Messrs. James Evans & Co., Salford, Manchester, have, as the result of numerous experiments carried on during the past three years, designed a very ingenious patent arrangement for the cooling and ventilation of stokeholds in steamships. In devising this new system of ship-ventilation, which is termed the "Anemogene," the principal objects have been to maintain perfect combustion, even under the most changeable atmospheric conditions, and to economise the coal consumption, whilst providing for the delivery of air cooler than the external temperature in the tropics, or in any other region, when necessary, and in such a hygroscopic condition as will render it most beneficial to the men engaged at the fires. The arrangement may be described as follows:—Compressed air enters the ventilator through a narrow nozzle, similar to the cone of an injector, and is then mixed with a small proportion of steam coming in by a wider opening. The high velocity of the air from the conical muzzle causes the air and steam to be well blended in the large chamber of the apparatus, from which, when it is necessary to cool the air, the air and steam are led through an aperture to a distributor, or, when atmospheric conditions warrant it, the steam alone or air alone can be dealt with in this manner. A valve at the other end of the chamber is opened proportionately to the amount of moisture required, and part of the steam in the chamber enters a coil or condenser terminating in a drib pipe, in reaching which the steam is condensed to water, and subsequently is pulverised to vapour when passing through the distributor already referred to. By this means the hot, dry air which is being driven down the trunks absorbs the vapour, and undergoes cooling to an extent which is easily regulated by adjusting the valve at the end of the chamber. The main casing of the apparatus is surrounded by thickness of asbestos, and to complete the lagging an outer case is provided. It is claimed that the "Anemogene" will create a down draught in the air trunks, ventilators, or windsails of a ship when atmospheric or other conditions would render it impossible, or lessen it in such a manner as to make the air trunks almost useless. We understand that it has already been very successfully tested on one of the Liverpool steamers and is being fitted on another vessel.

The Globe Engineering Co., of Manchester, have brought out an improved double-tube injector, which has been specially designed for large marine, locomotive, and stationary plants, where the conditions of working are too severe for the ordinary types of injector. In this arrangement the forcing, combining tube is solid without relief holes or spills, this method of construction being rendered practicable owing to the positive closing over-flow valve in the delivery chamber of the forcing apparatus. By this means, combined with the adoption of the principle of the lifting tubes acting as a governor to the forcing tubes, a great range is secured. The injector is worked entirely by one lever, and there are no outside connecting links, &c., to operate the overflow valve, the stem of which is rigidly connected to that of the main steam valve. The seats of the steam and overflow valves are independent of the casing, and are readily movable for cleaning, grinding, or renewal. The capacity can be efficiently regulated up to the highest pressures, and the injector is capable of delivering water into the boiler as high as 300 Fahr. Another advantage is that no adjustment is required when working at the lowest to the highest steam pressure on a long or short lift, under pressure, with hot or cold water, or under any conditions of working. The company have also introduced an improved single-tube automatic injector, in which the tube, which is entirely in one piece, has sufficient relief openings to enable the injector to start and restart promptly. The suction jet is securely screwed into the injector casing, and the steam jet has two seats, whilst no valve adjustment is required in the suction pipe. The overflow valve can be used as a lifter or non-lifter, and the jets can be easily removed without the aid of special tools.

An ingeniously designed bench drill is being brought out by Mr. T. Bradley, of Accrington, which will be found a very handy machine for use on board ship in the repairing shop. This drill, which is worked by hand-power, will operate upon iron, steel, or brass, and its special feature consists in the variety of ways in which it can be used, the machine being adaptable either as an ordinary bench drill, in which position it can be swivelled round in the socket when required as a radial for special work, or, owing to the peculiar construction of the baseplate, it can be screwed on to a wall, and the pillar support fixed horizontally into the socket, and swivelled round to operate horizontally, vertically, or at practically any angle required. The machine is provided with a heavy base, so that it does not need to be screwed down to the bench, whilst the head can be readily raised or lowered in order to adapt the drill to various thicknesses of work.

The new electric lighting installation at the Manchester and Salford Docks of the Ship Canal has now been completed, and a few particulars of the plant put down may be of interest. The previous system for lighting the docks was to a large extent only of a temporary character, being split up into three stations, with portable engines, which proved to be not only expensive, but inefficient. The supply has now, however, been placed on a permanent basis with one central station; this course of action having been taken by the company on the strong recommendation of their engineer, Mr. Hunter, with the result that whilst the working expenses are economised, nearly double the light obtained under the old system is now produced. The new plant includes two sets of 100 brake H.P. inverted cylinder engines by Goodfellow, of Hyde, and two sets of 30 B.H.P. similar engines by Browett & Lindley, Patricroft, each of the engines being fitted with ejector condensers. Previously the electric light was supplied by 66 continuous current arc lamps, which have been supplemented by 28 alternating arc lamps, 100 thirty-two candle power and 28 sixteen candle power incandescent lamps, the latter being used entirely for lighting the offices and sheds, Messrs. Baxendale & Co., Manchester, having carried out this part of the work. The steady growth of traffic has also necessitated a considerable addition to the hydraulic power at the Manchester end of the Canal, owing to the gradually increasing number of cranes and for operating the locks and bridges, and at the Mode Wheel Locks the present hydraulic plant is being supplemented by two sets of inverted cylinder jet condensing triple-expansion engines, each capable of giving off 20,000 gallons of water per hour at 40 revolutions per minute, with 160 lbs. boiler pressure, the Glenfield Co., of Kilmarnock having supplied this portion of the plant. A couple of steel Lancashire boilers, 8 ft. diameter by 30 ft. long, by the Oldham Boiler Works Co., provide the necessary steam power. Messrs. Frank Pearn & Co. are the makers of the boiler feed pumps, whilst for pumping water from the Canal to the supply tank there are two sets of horizontal duplex pumps. Altogether the new hydraulic plant forms a very important addition to the equipment of the Canal at the Manchester end, and will greatly facilitate operations in dealing with the large volume of traffic.

In the iron trade the improvement reported last month has been fully maintained, and a considerable weight of business has been put through both in raw and manufactured material, with prices as a rule firm at late rates, and showing an upw tendency in some quarters. For local and district foundry brands, prices are firm at 46s. 6d. less 2½, for Lancashire; 43s. for Lincolnshire, and 45s. to 47s. for Derbyshire, net cash delivered Manchester. In forge qualities, the chief demand for which is in the Warrington finished-iron-making district, a fair business has been done with prices for delivery there averaging 44s. less 2½ for Lancashire, and 42s. 2d. for Lincolnshire, net cash. Middlesbrough is not quite so strong as it was, good foundry brands being now obtainable at 45s. 6d. to 46s. net delivered Manchester, with Eglinton about 46s. 3d. delivered Lancashire ports; 46s. 9d. Preston, and 48s. 6d. delivered Manchester Docks, and Glengarnock about 9d. above these figures.

In finished iron, makers are booking new orders freely, with prices hardening. Although Lancashire bars could still, in most cases, be bought at £5 10s., they are stiffening up to £5 12s. 6d., with North Staffordshire £5 12s. 6d. to £5 15s.; sheets £7 5s. to £7 10s.; and hoops, £6 2s. 6d. for random, to £6 7s. 6d. for special cut lengths, delivered Manchester district, and 2s. 6d. less for shipment.

The steel trade shows no material change, with good foundry hematites quoted by makers 57s. 6d. less 2½, but obtainable at 6d. less from merchants; steel billets aveiaging £4 7s. 6d.; bars, £6, and boiler plates £6 5s. delivered in this district.

In the metal market there has been a good demand for all descriptions of manufactured goods, and although list rates are unchanged, prices tend upwards. Delivered Manchester district they remain as below: solid drawn brass tube boilers, 7d.; solid drawn brass surface condenser tubes, 8½d.; solid drawn copper tubes, 8½d.; brazed copper gas and steam tubes, 8¼d.; brazed brass gas tubes, 7¾d.; brass wire, 6½d.; copper wire, 7¾d.; rolled brass, 6¼d. per lb., and copper sheets £68 per ton.

The timber trade generally has been quiet, but with imports not excessive and deliveries fairly satisfactory, stocks are moderate, and values firm. East India teak meets with a ready sale, and prices are steady. Greenheart has met with considerable demand for the time of the year, and prices are higher with stocks light.

In the coal trade the practical collapse of the Conciliation Board has caused a good deal of anxiety as regards supplies on the part of consumers, owing to anticipations of a renewal of wages difficulties, and the extra pressure has enabled many of the pits to go on full time. House coals have been in good demand, with prices, although not quotably advanced, stiffening up to full list rates, and the same remark applies to steam and forge coals. Engine fuel, which was previously anything but plentiful, is rendered still more scarce with the rush of buying and prices generally have been advanced 3d. to 6d. per ton. At the pitmouth best Wigan Arley averages 10s.; Pemberton 4 ft. and seconds Arley, 8s. to 9s.; common house qualities, 6s. 6d. to 7s.; steam and forge coals about 6s.; common slack 3s. 6d. to 4s., and best sorts 4s. 9d. to 5s. 3d. per ton.

The shipping trade continues slow, with no improvement in prices.

BELFAST TRADE NOTES.

(*From our own Correspondent.*)

BUSY times are still the order of the day here, so far as the shipbuilding and engineering and allied trades are concerned. Inquiries for new tonnage are still numerous, and a fair proportion of orders are being placed with local builders. Among others may be mentioned that of three 5,000-ton cargo boats for the well-known Cunard Line. These steamers have been contracted for by Messrs. Workman, Clark & Co., which firm has within the last few years come rapidly to the front. The extensive addition to the boiler shops of this firm is being pushed forward rapidly, and a largely increased output should be the result. Messrs. Harland & Wolff have also commenced an addition to their already extensive engine shops, and, in fact, have now reached the boundary line of their ground. This last-mentioned extension is absolutely necessary to enable the engine works to keep pace with the firm's vast shipyard, in fact, at present the engineers are months behind time with the shipbuilders. This is partly due to the effects of the strike in the latter part of last year.

The yards ceased work for the annual summer holidays on Friday, 10th inst. Owing to the pressure of work, the notices were put up for only three days' holiday, but work was not generally resumed by the majority of the men till Monday, the 20th. This interruption, of course, tells against the tonnage launched during the month. So far, Messrs. Harland & Wolff have put one vessel into the water. This is the large twin-screw steamer *European*, built to the order of the West India and Pacific Steamship Co., Ltd., Liverpool. She is intended for the company's Liverpool to New Orleans service, and, with the exception of the sister ship, *American*, will be by far the largest cargo carrier in that trade. The vessel is 475 ft. long, with a tonnage of about 3,180. She will have four pole-masts, schooner rigged, and will be fitted with a complete installation of electric light. The machinery consists of two sets of triple-expansion engines.

This firm will also despatch the t.s.s. *Ikbal*, which, as mentioned last month, has been fitted up for the cattle trade.

The departure of the Union Co.'s mail steamer *Scot*, to resume her sailings to the Cape, also took place during the month. This fine steamer has certainly not suffered at the hands of Messrs. Harland & Wolff, and should she maintain anything like her original speed, her carrying capacity should be considerably increased by the lengthening process which she has undergone. This operation has occupied about five months in all. On her run round to Southampton she called at Holyhead and embarked Sir Francis Evans and a large party of gentlemen interested in her success. This preliminary trip proved most satisfactory to all concerned.

Messrs. Harland & Wolff have also shipped to Pembroke the second set of engines and boilers for H.M. battleship *Hannibal*, and at present the t.s.s. *Canada*, for the Dominion Line, is engaging the attention of the outside squad. The vessel has been moved down to the 100-ton crane, to receive her machinery.

Messrs. Workman, Clark & Co. have now practically completed the s.s. *Antenor*, for Messrs. A. Holt, Liverpool, and she is expected to run her trial trial trip during the present month.

NORTH-WEST OF ENGLAND.

(*From our own Correspondent.*)

Barrow.—The shipbuilding and marine engineering trades in this district have been briskly employed during the month, and this has been particularly the case in the work incidental to the finishing of H.M.S. *Powerful*, first-class cruiser, which left Barrow for her preliminary trials on July 13th, as described in another column. Efforts are also being made to despatch H.M.S. *Juno*, second-class cruiser, from Barrow, in the middle of August, while her sister ship, the *Doris*, is in a forward state, and will be delivered in the autumn months. When these ships have left, the fitting-up dock at Barrow will be tenantless unless, as is probable, in the meantime the steamer *Clan Sutherland*, building for Messrs. Cayzer, Irvine & Co., is launched, as well as two of the four torpedo-boat destroyers now building at Barrow, the *Avon* and *Bittern*. There is considerable activity in the building department of the Barrow yard at present, the work in connection with the construction of the *Niobe* receiving especial attention. This first-class cruiser will probably be launched next spring. Much progress is being made with her engines and with the Belleville boilers, with which she is to be fitted. The keel is being laid of the new twin-screw Channel steamer *Duchess of Devonshire*, for the Barrow and Belfast fleet. She is to steam 19 knots, and will, when she is ready next spring, be a great acquisition, not only to the Belfast service, but to the summer route from Barrow to the Isle of Man. During the month the Naval Construction and Armaments Co. secured an order from the Great Western Railway Co. to build two 20-knot twin-screw steamers for the Channel Islands service. The new steamers will be equal to anything afloat in the luxuriousness of their fittings and in the modern requirements for the comfort of passengers. Their measurements are to be 280 ft. long, with 34 ft. 4 in. beam, and 16 ft. moulded depth. The draught will be about 11 ft. 4 in., and the displacement 1,600 tons. The speed to be attained is 20 knots in service. Triple-expansion engines will be provided, having cylinders 23 in., 36 in., and 56 in. diameter by 33 in. stroke. Two boilers will be provided, both double-ended, the diameter being 15 ft. 2 in., and the length 19 ft. 6 in., while the working pressure of steam will be 175 lbs. The heating surface is to be 10,000 square feet, and the grate area 244 square feet. The steamers are to have a speed of 20 knots on service, the engines being of 6,000 I.H.P., and are to be ready for delivery at the opening of next year's season. The firms that submitted designs for these ships were Messrs. Denny, of Dumbarton, Earles, of Hull, the Fairfield Co., Harland & Wolff, and the Barrow Co., so that the success of the last-named firm should giver them the greater satisfaction. I believe the Great Western Co. considered as an element along with price the success of the London and North-Western Co.'s twin-screw steamer, *Duke of Lancaster*, which Mr. Adamson designed and built for the company a year or two ago. Two steamers are now to be built for the run between Weymouth and Jersey and Guernsey, but three more vessels are likely to be ordered later on. The Great Western authorities are said to be well satisfied with Barrow's terms. Perhaps it should be added that as Messrs. Thomson, of Clydebank, built all the steamers for the opposing company—the London and South-Western Railway—they did not tender. It will, however, be interesting to watch the competition between Barrow's Channel steamers and those of the Clydebank build. The latter have excelled the Laird boats on the Weymouth station, and it remains to be seen how they will compare with the new vessels. At present they are among the most reliable twin-screw boats on the English Channel service. The booking of an order of this class at Barrow is of importance in reference to the further opportunity it will afford the N. C. & A. Co. of showing what it can do in the building of high-class fast Channel steamers. The *Duke of Lancaster* has proved a remarkable success, and the London and North-Western and London and Yorkshire Railway Co.'s are highly pleased with her. They have sold the old *Princess of Wales*, and the new *Prince of Wales*, which have been lying up in the docks at Barrow for a long time past, and now they are open for another fast Channel steamer, the order for which it is expected they will soon place. The Fleetwood route has always been regarded as the best service across the Channel, and it is expected now that the Barrow Co. has ordered a steamer to beat the *Duke of Lancaster* in speed, the London and North-Western and London and Yorkshire Cos. will reply by placing an order even for higher speeded steamers than the Great Western Co. have ordered at Barrow. The Barrow Co., it is expected, will not be behindhand in the race, and other orders are expected to follow from various sources. In the midst of this competition Barrow as a shipbuilding centre is getting up its name. The Barrow Co. has tendered for one of the two line-of-battleships required for the Admiralty, and to be placed in the hands of private builders. It is no secret that the Barrow Co. desires the honour and the experience of building a line-of-battleship for the Admiralty, and doubtless the very excellent work done by them in the building of the *Powerful*, secured the third-class cruisers, torpedo-boats, and torpedo-boat destroyers, and will stand them in very good stead. After the orders are placed for battleships some contracts have to be given out for first and second-class cruisers, to be built in private yards. Some big commercial tonnage is also in the market, and local builders are in the running for some of it.

Hematites.—The hematite iron trade is steady, and some good business has been done during the month, leaving makers in an even better position for orders than they were in June. Makers, however, are much firmer in their transactions than are warrant holders, but it is only a small portion of the latter who are weak. There is quite a disposition to maintain the heavy stocks which have been accumulated, and which now represent about 316,000 tons. Makers are quoting 48s. 6d. per ton net f.o.b. for the mixed bessemer Nos., net f.o.b., but warrant iron is at 46s. 5d. net cash sellers, 46s. 4½d. buyers.

Shipbuilding Material.—There is a fuller demand for all sorts of shipbuilding materials, and the mills are as busy as they can possibly be. Orders are well held in advance, and new contracts are offering which will certainly maintain the activity at the mills not only for the remainder of this year, but well into next year. Plates for shipbuilding and boiler-making purposes are in very full consumption, and there is also a good business doing in heavy steel castings. Prices are firm and every effort is being made to augment the output as much as possible.

Shipping.—The shipping trade is busily employed, and the exports of pig iron and steel, and of steel especially, are very large and compare very favourably with previous years' returns. Freights, are however, low, and are not much of a source of profit to owners.

Reviews.

The Mechanical Engineer's Pocket Book. By D. K. Clark.
London: Crosby Lockwood & Son. 1896.

In issuing this, the third revised edition of Mr. Clark's most useful little book, the publishers call attention to the regretable fact that death removed the esteemed author just at the time the present edition was put in hand.

Though compilations of all sorts of tables in the form of more or less portable "Pocket Books" are now to be met with in legion, Mr. Clark's is the only one of these that has ever come under our notice which appears to have been compiled expressly for, and with a view to meeting the requirements of, the *mechanical* engineer, and the proportion of original tables, formulæ and data appears to be higher than in many other similar volumes.

The present edition extends to 650 pages, and contains, in addition to about 500 formulæ and rules with data of general utility classified for ready reference, upwards of 350 tables of results of calculations relating to the principal branches of mechanical practice, many of which have been compiled anew. The sections dealing with "Manufactured Metals," "Heat," "Steam Engines and Boilers," and with "Water Power," are, for this class of book, unusually long and interesting ones, while the inevitable (but always useful) tables of "Circles, Squares, Cubes, etc.," have their value enhanced by the interposition of a seventh column of figures giving the circular area corresponding to each number.

The book, of convenient size for the pocket, is neatly and strongly bound, well printed and illustrated with some 94 figures, and should prove a great saver of time to any mechanical engineer, as by its use the labour of calculation can be greatly abridged, and in many cases even entirely avoided.

Electric Lighting and Power Distribution. By W. Perrin Maycock.
Vol. I. London: Whittaker & Co. 1896.

This book has already, in four years, reached a third edition, and this is—especially when we consider the vast number of text books on electrical matters—the very highest tribute to the utility and accuracy of the work. The present edition embraces many new features, most of which will immediately commend themselves to the student and teacher. As the work is especially designed to prepare students for the technicological examinations of the City and Guilds of London Institute, the author has gone through the papers set in these examinations during the last six years, has checked his work by them, making sure that now, at least, every one of them can be answered from the text of the book, and has placed the questions themselves at the end of each of their respective chapters, so that it can be seen whether or not he is right in claiming that he covers all the necessary ground for the candidates for these examinations. The questions also fulfil the further, and far more important, purpose of showing teacher and pupil exactly what kind of ordeal it is which is to be prepared for and of enabling them to see if the proper knowledge is being assimilated to enable it to be passed with credit. There is, however, matter contained in the volume which is outside the need of the Institute student, and this is characterised in type of peculiar size. The arrangement of the book is good, and the information clearly given and lucidly explained. The work is throughout excellently illustrated, and should prove of value to all into whose hands it may come.

Hardware Dealers.—The Commercial and Intelligence Department of the Associated Trade and Industrial Press (nine years established), at 610, 13th Street, Washington, D.C., U.S.A., has compiled from first sources a list of the leading hardware dealers in Mexico, Central and South American countries, which will be sent on neatly type-written sheets to any address on receipt of postal money order for 5s., or its equivalent in the money of any other country. This is an opportunity at trifling cost, to pave the way towards new commercial connections in Spanish America.

Notice of Removal.—Messrs. Mayne, Curzon [illegible] ship Brokers, &c., have removed to larger [illegible] Gracechurch Street, E.C.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

African Prince.—On June 13th a steel steam trawler of about 100 tons gross, named the *African Prince*, was launched at South Shields. Owner, W. H. Storey; port of registry, North Shields.

Golden Crown.—On June 13th the *Golden Crown*, an iron steam ketch, of about 150 tons, was launched at Beverley, owned by Messrs. Hall, Leyman & Co., of Hull.

Lucania.—On June 13th the *Lucania*, an iron steam vessel, of about 150 tons, was launched at Beverley, owned by Messrs. E. J. Williams & Co., Limited, of Hull.

Zapad.—On June 20th Messrs. R. & W. Hawthorn, Leslie & Co., Limited, launched at Hebburn-on-Tyne a steel twin-screw passenger and cargo steamer, 216 ft. 6 in., by 28 ft. by 14 ft. 4 in., the second of two building to the order of the Eastern Carrying, Storing, and Warrant Co., of St. Petersburg. The vessel is built to the requirements of Bureau Veritas, and designed and fitted throughout for the Caspian Sea trade, for which the company intend her. She was named the *Zapad*.

Principessa Christiana.—On June 23rd Messrs. Osbourne, Graham & Co. launched at Hylton, on the Wear, a steel screw steamer of 4,350 tons deadweight capacity, which has been purchased from them by an Austrian firm. The principal dimensions of the vessel are:—Length, 308 ft. 6 in.; breadth, 42 ft.; depth of hold, 20 ft. 3 in. She has been built under special survey to Lloyd's highest class, and will be fitted with tri-compound engines by Messrs. George Clark, Limited, of Southwick Engine Works, having cylinders 22½ in., 37 in. and 61 in. diameter, with 42-in. stroke, and large boilers working at 160 lbs. pressure. The vessel was named *Principessa Christiana*.

Ninette.—On June 25th Mr. D. Dewdney launched a new yacht from his yard at Brixham. She has been built to the order of Mr. A. H. Harman, is yawl-rigged, 50 ft. between perpendiculars, 14 ft. beam, and has over 6 ft. head-room in her saloon; 31 tons Y.M., and is called the *Ninette*.

Mary A. Short.—On June 26th Messrs. Short Brothers, Pallion, Sunderland, launched a steel screw steamer named *Mary A. Short*, built to the order of Mr. James Westall, of Sunderland, and of the following dimensions:—Length, 360 ft.; breadth, 47 ft.; and depth moulded, 27 ft. 4 in.; with a deadweight carrying capacity of 5,650 tons on Lloyd's summer freeboard. She is being fitted with triple-expansion engines by Messrs. W. Allan & Co., Limited, having cylinders 25 in., 40 in., and 67 in. in diameter respectively, with a stroke of 45 in., steam being supplied at 160 lbs. pressure by two large steel boilers. This vessel, which is constructed to the highest class in Lloyd's register with one deck laid, is the largest yet built of this type. There ara four cargo holds, with a large hatchway to each, with six powerful steam winches. For the working of deck machinery a large multitubular donkey boiler is provided. The double bottom, which is continuous fore and aft, is divided into six compartments for trimming purposes.

Moorby.—On June 26th Messrs. Ropner & Son launched at Stockton a steel screw steamer, built for a West Hartlepool firm, of the following dimensions, viz.:—Length, between perpendiculars, 300 ft.; breadth, 43 ft.; moulded depth, 19 ft. 8 in. The steamer is built off the part awning-decked rule, having poop and raised quarterdeck, her deadweight carrying capacity being 3,770 tons on 18 ft. 8 in. The saloon and cabins for the captain and officers are fitted in the poop, whilst the engineers are accommodated in iron houses placed on the awning-deck near the entrance to engine-room. She is built on the web frame principle, leaving the holds entirely clear for cargo, and carries her water ballast in a cellular bottom, and in the after peak. All labour saving appliances are fitted for the economical working of the steamer, and also for the expeditious loading and unloading of cargoes; she has steam steering gear amidships and screw gear aft, four powerful steam winches, two large donkey boilers working at the same pressure as the main boilers, patent windlass, stockless anchors, &c. The engines will work up to about 900 effective H.P., and are by Messrs. Blair & Co., having cylinders 22½ in., 36½ in., 60 in. by 39 in. stroke, steam being supplied by two large steel boilers working at 160 lbs. pressure. The name of the steamer is *Moorby*, the christening being performed by Mrs. Robert Ropner, jun.

Ulster.—On Saturday, June 27th, was launched the first of the four new Irish mail boats, which are being built by Messrs. William Laird Bros., of Birkenhead, to the order of the City of Dublin Steam Packet Co. The vessels, which are to be named *Ulster*, *Munster*, *Connaught* and *Leinster*, are being provided to meet the requirements of the accelerated mail service between Holyhead and Kingston, the contract for which was secured by the City of Dublin Steam Packet Co., who have for many years carried the mails between England and Ireland. The new steamers are to accomplish the journey in half an hour less time than that occupied by the vessels now in the service. The new steamer is 372 ft. in length, with 41 ft. 6 in. beam, and 29 ft. 3 in. in depth, and is of 3,069 tons register. The load draught is 14½ ft., and the propellers of manganese bronze. The material of the hull is steel. There are 10 watertight compartments. If the two largest of these should become filled with water the vessel would still be in a perfectly safe condition. The machinery consists of two independent sets of inverted direct-acting tri-compound engines, each set having one high, one intermediate, and two low-pressure cylinders. The shafts, piston rods, connecting rods, &c., are of steel, and the air pumps are vertical, one to each set of engines, worked from the piston rod crossheads. The circulating pumps and main and auxiliary feed engines, and powerful bilge and fire engines, are all worked independently. The boilers are of steel, four in number, double-ended, each having six furnaces, Morison's corrugated, and the working pressure is 175 lbs. per square inch. The boilers are to be worked on the closed stokehold system. The electric light installation, which is in duplicate, is of very ample capacity. There will be two funnels and two pole masts, and a turtleback of about 70 ft. long forward, and a flush upper deck, on which there will be three deckhouses containing the entrances to the cabins, smoke-room, ladies' deck saloon, &c. On the main deck the cabins extend unbroken from end to end of the ship, the machinery being entirely below the deck. The light and air shafts from the engine-room are carried to the top of the houses, forming "boat decks," so that the machinery is entirely out of sight. The first-class dining saloon, situated on the main deck, forward of the machinery space, is 40 ft. long and 34 ft. broad, extending the full width of the vessel. It will be capable of dining about 80 passengers at one sitting. The sleeping accommodation for the first-class is arranged on the main deck, and there are also 14 first-class state-rooms on the lower deck forward and aft of the machinery. The ladies first-class cabin is on the main deck abaft the machinery space, and there is a ladies' deck saloon on the upper deck in the after deckhouse. The launching ceremony was witnessed by a large number of invited guests, and the new vessel, on leaving the ways, was christened the *Ulster* by Her Grace the Duchess of Abercorn.

Bullionist.—On June 27th a steel steam turret-deck schooner of about 3,460 tons, named the *Bullionist*, was launched at Sunderland, owned by Messrs. Angier Bros., of London.

Benton Castle.—On June 27th a steel steam ketch, of about 150 tons, named the *Benton Castle*, was launched at North Shields; owned by G. H. D. Birt, Esq., of Milford Haven.

Clio.—On June 27th a steel steam ketch, of about 150 tons, named the *Clio*, was launched at North Shields; owned by F. J. Sellick, Esq., of Milford Haven.

Dona Amelia.—On Saturday afternoon, June 27th, there was launched from the yard of Messrs. John Blumer & Co., North Dock, Sunderland, the handsomely modelled screw steamer *Dona Amelia*, built to the order of J. H. Andresen, Esq., of Oporto. This vessel, which is intended to trade between Oporto and Brazil, is of the following particulars and dimensions:—Length, registered, 313 ft. by 43 ft. by 21 ft. 9 in.; class 100 A.1., built under special survey, spar deck rule, and designed to carry about 3,550 tons on 19 ft. 4 in., with a net tonnage of about 1,750. Separate compartments for water-ballast on cellular principle are fitted in each hold and under engines with a capacity for holding about 550 tons. The framing in holds is constructed on the deep frame system, leaving the holds entirely free for cargo. The main and spar decks are of steel sheathed with wood, whilst the poop, bridge, and forecastle decks are of pine. The deck erections consist of full poop, bridge and topgallant forecastle. The fore part of the bridge is elaborately fitted for the accommodation of thirty first-class passengers, each berth being fitted with separate steam heater. Bathrooms and lavatories are fitted up in the most improved style. The saloon is very tastefully fitted in hardwood, having two tables with revolving chairs at each side and ends. The saloon is lighted and ventilated by a teak skylight, which extends almost its full length, also by four large sliding windows with brass protecting rails. A neatly designed sideboard is placed at each side of the fore end of the saloon, in the centre of which is placed a large photograph bearing the sign manual of Her Majesty the Queen of Portugal, whose name (by special permission) the vessel bears. It is expected that the King and Queen of Portugal will inspect the *Dona Amelia* on her arrival at Lisbon or Oporto. The bridge sides in way of engines and boilers are fitted up for the accommodation of officers and engineers, and the crew have spacious accomodation under the topgallant forecastle. The fore 'tween decks contain accommodation for 250 steerage passengers, divided into four compartments, each having separate entrance from spar deck. The bed fittings for the same are being supplied by Messrs. Hoskins & Son, Birmingham. Hospitals, ventilators, and lavatories are being fitted to comply with the United States Passengers Act. Both fore and after 'tween decks are lighted and ventilated with large sidelights, as well as large extra ventilators. There is a large teak house on bridge deck containing smoke-room, ladies' room, and accommodation for captain, the whole being fitted up in the best style. The life-saving appliances are fitted in accordance with American rules and regulations, and comprise eight life-boats, rafts, etc. The deck machinery is of the most improved type, and consists of four powerful steam winches by Mr. J. Wigham, of Hylton, patent steam steering gear by Messrs. J. Lynn & Co., placed in house at after end of bridge controlled by shafting from upper bridge, patent direct acting steam windlass by Messrs. Emerson, Walker & Thompson Bros., and patent hand gear aft by Messrs. Crawford & Son, of Sunderland. The whole of the vessel is lighted by electricity. The plant and fittings are being supplied by Messrs. The Sunderland Forge Co., Sunderland. Messrs. A. W. Paul & Co.'s patent fresh water condenser, capable of condensing 750 gallons per day, is fitted for the use of the forward passengers and crew. The machinery is being constructed by the North-Eastern Marine Engineering Co., Limited, having cylinders 23½ in., 38 in., and 62 in., with a stroke of 42 in. The boilers are of steel, having a working pressure of 160 lbs. per square inch. The whole being constructed to pass the rules and regulations of the United States Passenger Act. On leaving the ways the christening ceremony was gracefully performed by Mrs. Arthur Robson, Falstone House, Roker. During construction the vessel has been surveyed, on behalf of the owner, by Mr. J. S. Tetley, of Leeds.

Armenia.—There was launched on Saturday afternoon, June 27th, from the Jarrow yard of Messrs. Palmer's Shipbuilding and Iron Co., Limited, a large screw steamer, built to the order of the Hamburg-American Steam Navigation Co., of Hamburg. Her dimensions are as follows: — Length, between perpendiculars, 400 ft.; beam, 50 ft.; depth, moulded, about 30 ft. 3 in. The vessel will be rigged as a two-masted fore-and-aft schooner, and has been constructed under special survey to obtain German Lloyd's highest class, and is of the three-deck type, with a combined poop and bridge extending to after end of main hatch, and a topgallant forecastle. The main and upper decks are of steel all fore and aft, and all the exposed decks are sheathed with wood. A double bottom for water ballast is fitted all fore and aft, and divided at the centre line for the purpose of assisting to trim the vessel, a separate system of piping being fitted on each side of centre line division, enabling each compartment to be fitted and emptied independently. The vessel has been designed for the emigrant, cattle, and general cargo trade, and will be lighted throughout by electricity and fitted completely with all the latest improvements for this service. The accommodation for the captain, officers, engineers, and also galleys and emigrants hospitals, &c., will be in deckhouses on the top of the bridge and in side houses in fore end of bridge; and also part of the lower 'tween deck aft will be fitted with accommodation for 300 or 400 emigrants. The emigrants' berths are of Hoskins' latest patent, and are fitted along each side in separate rooms for ten persons each, the centre of the deck being left clear for the table, seats, &c. The whole of the fittings are portable, and the space may thus be readily converted for carrying cattle or general cargo. The remainder of the 'tween decks, not occupied by the emigrants, will be fitted for cattle, and a complete system of water services, sidelights, fan-ventilators, &c., will be supplied and fitted as in first-class cattle boats. A small insulated space is fitted in the lower hold aft with refrigerating machinery, &c., complete for stowing ice, vegetables, and meat for the use of the emigrants and crew. The remainder of space in lower holds to be fitted for general cargo, and a complete system of steam winches, derricks, and steam cranes for the efficient working of general cargoes will be fitted. The engines, which are also built by the Palmer Co., are of the four crank quadruple-expansion type on the Schlick system, with cylinders 22½ in., 32 in., 47 in. and 68 in., by 51 in. stroke, steam being supplied by one double and two single-ended cylindrical boilers, working pressure of steam 210 lbs., with modern apparatus and appliances for the most efficient and economical working are being fitted, and the whole of the vessel and machinery is being constructed to meet the requirements of the German emigrant service. As the vessel left the ways she was gracefully christened the *Armenia* by Mrs. Dugdale, wife of Mr. W. H. Dugdale, shipyard manager of the Palmer Co. The company then adjourned to the model room, where the usual congratulatory toasts were honoured.

Staintondale.—On June 29th Messrs. John Readhead & Sons, launched from their shipbuilding yard at West Docks, South Shields, a steel screw steamer, built to the order of Messrs. P. Hick, jun., & Co., Scarborough. Her dimensions are as follows:—Length, 304 ft.; breadth, 44 ft.; depth, moulded, 23 ft. 1 in.; her deadweight capacity being about 4,100 tons on a light draught. The vessel is of the improved single deck type, having cellular bottom fore-and-aft; high poop aft, with deckhouse and entrance to cabins, long bridge and topgallant forecastle. She is also fitted with the latest improvements for the rapid and efficient handling of cargoes. Her engines, also constructed by Messrs. John Readhead & Sons, are of the triple-expansion type, having cylinders 23 in., 37½ in., and 61½ in., by 30 in. stroke, steam being supplied by two large steel boilers, working at a pressure of 160 lbs. per square inch. As the vessel left the ways she was named the *Staintondale* by Miss Mary Hick, daughter of Captain James W. Hick.

Emperor.—On July 4th Mr. Henry Scarr, Navigation Iron Works, Beverley, launched an iron keel, built to the order of Mr. Henry Mellor, of Wakefield. Her dimensions are:—Length, 77 ft.; breadth, 14 ft.; depth, 7 ft.; and carrying capacity, 150 tons. As the vessel left the ways she was named *Emperor.*

Huldra.—On July 9th Messrs. Priestman & Co. launched at Southwick a new screw steamer, named the *Huldra.* She has been built to the order of Mr. G. Wolff Pedersen, Christiania, Norway. The principal dimensions are:—Length, 235 ft.; breadth, 34 ft.; moulded depth, 14 ft. 9 in. to the main deck; and she has been built to the highest class at "Det Norske Veritas," under the partial awning deck rule. Her engines have been constructed by Messrs. William Allan & Co., of Sunderland, and are of the triple-expansion type, having cylinders 17 in., 28½ in., and 46 in., by 30 in. stroke.

St. Agnes.—On July 10th Messrs. Hansen & Sons launched at East Cowes a composite cutter yacht, which they have built for Mr. J. S. Carroll, of Dundall, Ireland. The yacht is named *St. Agnes.* Her principal dimensions are:—Length, 64 ft.; breadth, 13 ft.; draught, 10 ft; tonnage, y.m., 65.

Don.—On July 11th there was launched from the shipbuilding yard of Messrs. Robert Stephenson & Co., Limited, Hebburn, an iron towing hopper barge, built to the order of the Jarrow Corporation. This barge has been designed for the removal of the town refuse of Jarrow. Her principal dimensions are: 96 ft. 6 in. between perpendiculars, 30 ft. moulded breadth, and 11 ft. 2 in. deep. The hopper is of large capacity to enable her to take to sea 350 tons of refuse. She is fitted with powerful winches for hoisting the doors and a special arrangement of slipping gear for letting the doors fall. She has also a powerful hand windlass and steering gear. She is classed 100 A1 at Lloyd's, and has been built under the supervision of Mr. Petrie, the corporation surveyor. The vessel on leaving the ways was named the *Don.* Messrs. Stephenson have lately completed another refuse hopper for the South Shields Corporation.

Kinsale.—On Friday, July 10th, Messrs. Richardson, Duck & Co. launched from their yard a steel screw steamer of the following dimensions:—Length over all, 319 ft. 6 in.; beam extreme, 44 ft.; depth, moulded, 22 ft. 10½ in.; gross tonnage, 2,420 tons; deadweight, 4,000 tons on 18 ft. 6 in. This vessel, which has been built to the order of Messrs. Farrar, Groves & Co., of London, will class 100 A1 on Lloyd's register, and has been built under special survey. She is of the single-deck type, having a poop aft for accommodation of captain and officers, bridge over engines and boilers, with accommodation for engineers in after end and a topgallant forecastle for crew. A double bottom throughout and after peak-tank are fitted for water ballast, and the equipment includes four steam winches, large horizontal donkey boiler, steam windlass, steam steering gear, stockless anchors, etc. The engines are by Messrs. Blair & Co.—cylinders, 22½ in., 37 in. and 61 in. by 42 in. stroke, steam being supplied by two single-ended boilers, working at 160 lbs. pressure. As the vessel was leaving the ways she was christened *Kinsale* by Mrs. E. J. Vie, of Stockton.

Waimate.—On July 11th Messrs. R. & W. Hawthorn, Leslie & Co., Limited, launched a large steamer at Hebburn-on-Tyne. The vessel is of large dimensions, 435 ft. by 54 ft. by 32 ft. She is built to the order of the New Zealand Shipping Co., of London, for their Australian trade, and is specially fitted for carrying frozen meat, with duplicate refrigerating machinery, of Messrs. Linde's system. She is classed at Lloyd's 100 A1, and has three decks. The machinery, which is being constructed by the same firm at their St. Peter's works, consists of a set of triple-expansion engines capable of indicating upwards of 3,000 H.P., with three large single-ended steel boilers, working at a pressure of 160 lbs. per square inch. These boilers are to be worked on Howden's system of forced draught. The vessel was named *Waimate.*

Queen Cristina.—On July 13th Messrs. Bartram & Sons launched at Sunderland a steel screw steamer for Messrs. Thomas Dunlop & Sons, Glasgow. The vessel is of the spar-deck type, with long bridge and topgallant forecastle, and is of the following dimensions:—Length, 344 ft.; breadth, 45 ft.; depth 28 ft. 9 in. She has been built to the highest class in Lloyd's Registry, and under the supervision of Captain A. H. Jack on behalf of the owners. The engines will be supplied by Messrs. J. Dickinson & Sons, Limited, Sunderland, the cylinders being 24½ in., 40 in., and 66 in. by 45 in. stroke. The vessel was named *Queen Cristina.*

Mars.—On July 13th the steel screw steamer *Mars*, built by Messrs. William Gray & Co., Limited, for Messrs. Schmidt & Hansen, of Flensburg, through Messrs. E. A. Casper & Co., of West Hartlepool, was launched. She is a sister ship of the *Jupiter*, lately launched for the same firm, and is intended for the timber and general cargo trades, and her dimensions are:—Length, over all, 280 ft.; breadth, 39 ft.; depth, 18 ft. 2 in., to class 100 A1 at Lloyd's. She has a long raised quarterdeck, long bridge and topgallant forecastle, and houses on deck for cabins. The hull is built with deep framing and cellular double bottom, and the equipment will be of the most improved description, including patent donkey boiler, steam steering gear, four steam winches, etc. She will have triple-expansion engines, made at the Central Marine Engine Works of Wm. Gray & Co., Limited, having cylinders 19 in., 30½ in., and 51 in., with a piston stroke of 36 in. and a large steel boiler to work at a pressure of 160 lbs. per square inch. The ceremony of naming the ship was gracefully performed by Miss Hansen, niece of Captain Schmidt, and sister of Mr. Hansen, owners.

Maceio.—On Monday, July 13th, Sir Raylton Dixon & Co. launched from Cleveland dockyards, Middlesbrough, a fine steel screw steamer which has been built to the order of the Hamburg South American Steamship Co., for their passenger and general traffic to Rio Grande, under the supervision of Mr. F. G. Dietze. The vessel is of the spar-deck type and has been constructed under special survey for Bureau Veritas highest class, the principal dimensions being:—Length, 310 ft. 6 in.; beam, 41 ft. 2 in.; depth, moulded, 26 ft., with a deadweight carrying capacity of about 4,000 tons on a light draught. The accommodation for first-class passengers is under the bridge with dining saloon in house on bridge deck, all of which will be handsomely fitted up. Commodious and well ventilated quarters for about 326 emigrants are also provided aft in poop and 'tween decks. The decks are sheathed with teak and all the fittings and accommodation are of a particularly complete and first-rate description. Triple-expansion engines will be supplied by Messrs. Thos. Richardson & Sons, Limited, Hartlepool, having cylinders 20 in., 33 in., 57 in. by 45 in. stroke, with two large boilers working at 205 lbs. pressure. This is the second steamer Sir Raylton Dixon & Co. have launched for the same owners within three months. On leaving the ways the vessel was named *Maceio* by Mrs. Thomas Dixon.

Queen Eleanor.—On July 13th Messrs. Bartram & Sons, Sunderland, launched from their yard the s.s. *Queen Eleanor*, a large and beautifully-modelled steel screw steamer, for Messrs. Thomas Dunlop & Sons, Glasgow. The vessel is of the spar-deck type, with long bridge and topgallant forecastle, and is of the following dimensions:—Length, 344 ft.; breadth, 65 ft.; depth, 28 ft. 9 in., and will carry a large cargo on a moderate draught of water. She has been built to the highest class in Lloyd's registry, and under the supervision of Captain A. H. Jack on behalf of the owners. There are six steel bulkheads, and the double bottom, which is on the cellular principle, will contain an extra large quantity of water ballast. There are no hold beams, and the holds are particularly clear of obstructions, and suitable for general cargoes. The decks are of extra thickness to guard against corrosion, and the vessel is in many respects built in excess of Lloyd's requirements. The deck machinery consists of five large steam winches, made by Messrs. Clarke, Chapman & Co., Limited, Gateshead, who also supply the direct-acting steam windlass, one of Riley Brothers' multitubular donkey boilers, and steam steering gear, by Messrs. Caldwell & Co., Limited, Glasgow, placed at the after end of the engine-room, and controlled by the helmsman on the bridge. The engines will be supplied by Messrs. J. Dickinson & Sons, Limited, Sunderland, the cylinders being 24½ in., 40 in., 66 in. by 45 in. stroke. The boilers are of extra large size, and will be fitted with Howden's system of forced draught, the working steam pressure being 160 lbs. In addition to the usual machinery, the engines will be fitted with steam turning engine, steam ash hoist, Owen's patent pumps, Morison's evaporator, Weir's filter, and Kirkaldy's feed heater. During construction the engines have been inspected by Mr. Broom, of Glasgow, on behalf of the owners. As the vessel left the stocks she was christened *Queen Eleanor* by Miss Ruby Dunlop.

Steam Trawlers.—On July 13th Messrs. Cochrane & Cooper, of Grovehill, Beverley, launched two steam trawlers, between 90 ft. and 100 ft. long, for the Atlas Steam Fishing Co., of Grimsby. The engines will be constructed by Earle's Co., Hull.

Æon.—On July 13th Messrs. Ropner & Son, of Stockton-on-Tees, launched, to the order of Mesers. Newman & Dale, of London, a steel screw steamer of the following dimensions, viz.:—Length, between perpendiculars, 314 ft.; breadth, extreme, 44 ft.; and moulded depth, 23 ft. 3 in. The vessel is built off the single decked rule "with freeboard," having half poop, bridge and topgallant forecastle. Her deadweight carrying capacity is 4,100 tons on 19 ft. draught. The engines will work up to about 900 effective H.P,, and are by Messrs. Blair & Co., Limited, having cylinders 22½ in., 37 in. and 61 in., by 39 in. stroke, steam being supplied by two steel boilers, working at 160 lbs. pressure. The name of *Æon* was given to the vessel.

Hillcrag.—On Tuesday afternoon, July 14th, there was launched from the yard of Messrs. Robert Thompson & Sons, Southwick, a handsome cargo steamer named the *Hillcrag*, for Messrs. Hugh Evans & Co., of Liverpool. The dimensions being:—Length, 340 ft.; breadth, 47 ft.; depth, moulded, 25 ft. 10 in.; with poop aft, accommodation for captain, officers, and engineers being in the bridge amidships, and topgallant forecastle for sailors and firemen. Water ballast on the cellular principle, with peak tanks, five large hatches, and five powerful steam winches, double derricks for rapid loading and discharging, also cargo ports in sides. The vessel will carry about 5,000 tons on a light draught. The engines, which are being supplied by Messrs. Geo. Clark, Limited, have cylinders 24 in., 39 in., and 64 in., with 42 in. stroke, and two extra large boilers. During construction both hull and machinery have been superintended by Mr. J. Thomas, of Liverpool, and Mr. J. Baxter, of Newcastle.

Harbury.—On July 17th Messrs. S. P. Austin & Son launched from the Wear Dockyard, Sunderland, the steel screw steamer *Harbury*, built to the order of a London firm of shipowners and coal merchants. The dimensions are as follows, viz.:—Length, 268 ft.; breadth, 37 ft. 6 in.; depth, 19 ft. 9 in.; and the vessel has been constructed under special survey at Lloyd's to class 100 A1. Her machinery, to be supplied by Messrs. George Clark, Limited, of Southwick Engine Works, Sunderland, will be of tri-compound type to indicate 900 H.P.

John Christie.—On Friday, July 17th, Messrs. Short Bros. launched from their shipbuilding yard at Pallion a handsomely-modelled steel screw steamer, built to the order of Aktie Selskebet Hekle, of Christiania, of the following dimensions, &c.:—Length, 259 ft.; breadth, 36 ft. 9 in.; and depth, moulded, 20 ft. 4 in.; with a deadweight carrying capacity o about 2,450 tons. The vessel has been built under the specia supervision of Lloyd's and Det Norske Veritas surveyors. The holds are clear of beams and web frames, the construction of the framing being on the deep frame principle, thus dispensing with hold beams and web frames. There are four large hatchways, with a powerful steam winch at each. The bottom of the vessel is constructed on the cellular principle for water ballast throughout, and is subdivided into various compartments for trimming. The captain, officers', and engineers' accommodation is in a house on the bridge (the saloon being handsomely fitted up in polished hardwood), and the crew in the topgallant forecastle. Every modern appliance has been fitted for the convenience of loading and discharging. The vessel is fitted with triple-expansion engines and boilers by Messrs. W. Allen & Co., Limited, Sunderland, with all the latest improvements in marine engineering, the cylinders being 19 in., 31 in., and 51 in. diameter, with a stroke of 36 in., the working pressure being 160 lbs. During construction the vessel and engines have been superintended on behalf of the owners by Captain Douglas Mail. On leaving the ways the vessel was named *John Christie*, the ceremony being performed by Mrs. Magnus Mail, junr.

Commonwealth.—On Saturday, July 25th, Messrs. Furness, Withy & Co., Limited, launched from their yard at Hartlepool, a large steel screw steamer, built to the order of Messrs. R. Stewart & Co., Liverpool. She is a fine type of a modern cargo boat, measuring over 340 ft. in length, and built throughout of Siemens-Martin steel, with a large measurement and deadweight capacity, and built to the highest class at Lloyd's. The vessel is of the spar deck type, with poop, bridge, and topgallant forecastle. The holds are fitted with iron grain divisions, and all deck erections, skylights, bulwarks, bulkheads, &c., are constructed of steel and iron. Cellular bottom fitted all fore and aft for water ballast. The greater portion of the plates are in 24 ft. lengths, making the structure of the ship very strong. Six steam winches, donkey boiler, patent steam steering gear amidships, screw gear aft, direct steam patent windlass, stockless anchors, hauling into hawse pipes, and other modern appliances are fitted for the handy working of the vessel. The saloon and cabins providing accommodation for the captain, &c., is handsomely finished in polished hardwood. The steamer will be rigged as a two-masted fore-and-aft schooner; and has been constructed under the supervision of Mr. W. Menzies, of Newcastle-on-Tyne. She will be fitted with triple-expansion engines by Messrs. Westgarth, English & Co., Middlesbrough. On leaving the ways she was gracefully christened *Commonwealth* by Miss Schofield.

Barnesmore.—On Saturday afternoon, July 25th, Messrs. Richardson, Duck & Co. launched from their yard a steel screw steamer of the following dimensions:—Length, over all, 342 ft.; breadth, extreme, 46 ft.; depth, moulded, 26 ft. 9 in.; tonnage gross, 3,220 tons. This vessel, which has been built to the order of Messrs. Wm. Johnston & Co., Limited, of Liverpool, will class 100 A1 at Lloyd's under special survey. She is of the single-deck type, with short poop aft, long bridge amidships, with engineers' accommodation after end, captain and officers being berthed in a large house on bridge-deck, and crew in topgallant forecastle. A cellular double-bottom throughout and peaks are fitted for water ballast, and equipment includes six steam winches, large multitubular donkey boiler, by Messrs. Blair & Co., steam windlass, stockless anchors, steam steering gear, double derricks to all hatches, &c. The engines, by Messrs. Blair & Co. are triple-expansion, having cylinders 22½ in., 39½ in., and 67 in. with a stroke of 42 in., steam being supplied by two single-ended boilers with a working pressure of 200 lbs. The vessel was named *Barnesmore*.

Kenneth Victor.—On June 13th was launched a three-masted barquentine, built by Messrs. Dible & Sons, for the Brazilian and Newfoundland trade, at the Belvidere Shipyard, Southampton. The dimensions are:—Length, 110 ft. 9 in.; breadth, 24 ft.; depth, 11 ft.; builders' measurement, 288·24·94 tons. She has been constructed of oak teak, and pitch pine, copper-fastened throughout, and built under special survey to class 14 years A1 at Lloyd's. The christening ceremony was performed by Master Cuthbert Dible, eldest son of Mr. William Dible, and the vessel was named after that gentleman's youngest son, *Kenneth Victor*.

Steel Barges.—Messrs. R. Williamson & Son, of Workington, have launched during the last month seven steel barges, all of which are for work on the Amazon. The dimensions of the vessels are as follows:—Three barges, length, 82 ft.; breadth, 22 ft. 6 in.; depth, moulded, 7 ft. 6 in.; three barges, length, 60 ft.; breadth, 17 ft.; depth, moulded, 6 ft.; and one barge, length, 60 ft.; breadth, 15 ft.; depth, moulded, 5 ft. 6 in.

LAUNCHES—SCOTCH.

Luigia Premuda.—On June 25th a steel steam schooner, of about 1,253 tons, named the *Luigia Premuda*, was launched at Campbeltown.

Clint.—On June 26th Messrs. Fullerton & Co. launched at Paisley a steel screw-steamer of about 300 tons, named the *Clint*, which has been built to the order of Messrs. Pattinsons & Winter, of Whitehaven, for their local carrying trade. The steamer will be fitted with compound engines of 400 I.H.P. by Messrs. Ross & Duncan, Govan.

Venus.—On June 27th Messrs. Russell & Co., shipbuilders, Port-Glasgow, launched a steel spar-deck screw steamer of 3,560 tons register, to carry 5,700 tons deadweight, to the order of Mr. John Lockie, Newcastle-on-Tyne. The dimensions are:—Length, 340 ft.; breadth, 46 ft.; depth, 28 ft. 6 in. The steamer is named *Venus*, and will be supplied with triple-expansion engines by Messrs. Rankin & Blackmore, Greenock.

Annie Thomas.—On June 27th Messrs. Mackie & Thomson launched from their yard at Govan a sailing vessel of 1,940 tons, which they have built for Messrs. William Thomas & Co., Liverpool. The dimensions are:—Length, 267 ft.; breadth, 40 ft.; and depth, 24 ft. 4 in. The vessel will be a three-masted full-rigged ship, and has a full poop for the accommodation of captain and officers, and rooms under the bridge amidships for the crew. There is a donkey boiler and a steam winch for the proper handling of cargo, a topgallant forecastle, and all the latest improvements in sailing-ship construction. As she left the ways, the vessel, which is intended for the general trade, was named *Annie Thomas* by Mrs. Thomas, wife of Mr. William Thomas. After the launch the vessel was towed into the Cessnock Dock, where she will be fitted out.

Onipenta.—On June 29th Messrs. Denny Brothers launched at Dumbarton a steel screw steamship named the *Onipenta*, of dimensions 410 ft. by 50·9 ft. by 28·95 ft. and 5,300 tons gross register. She has been built to the order of the British India Steam Navigation Co.

Clan Chisholm.—On June 29th Messrs. Alex. Stephen & Sons launched from their shipbuilding and engineering works at Linthouse a beautifully-modelled steel screw steamer of about 2,700 tons, for the Clan Line (Messrs. Cayzer, Irvine & Co., Glasgow). The dimensions are:—Length, 312 ft.; breadth, 40 ft.; and depth, 26 ft. 2 in. The hull has been constructed under Lloyd's special survey for their highest class of 100 A1 three-deck rule. There is a double bottom for water ballast. The appliances for the working of both ship and cargo are of the most modern description and include steam and hand steering gear, steam windlass, steam winches, &c. The accommodation for captain, officers and engineers, &c., is partly on bridge deck and partly under bridge at after end, all the apartments being fitted up in a substantial and comfortable manner. The crew, as usual, are berthed in poop. The engines are of triple-expansion type, having cylinders 23 in., 38 in. and 63 in. diameter respectively, by 42 in. stroke, and will be supplied with steam, at 200 lbs. working pressure, by two steel boilers. The vessel, which is the first of two on order, and the thirteenth steamer built at Linthouse for the Clan Line, was gracefully named *Clan Chisholm* by Miss Wilson, daughter of Captain Wilson, Marine Superintendent of the Clan Line.

Kittiwake.—On June 30th there was launched from the shipbuilding yard of Messrs. Scott & Sons, Bowling, a cargo steamer namer *Kittiwake*, which has been built to the order of the North British Steam Packet Co., for their Silloth and Liverpool trade in connection with the North British Railway system. The steamer was at once towed to the Queen's Dock, Glasgow, to receive engines and boiler, which are to be supplied by Messrs. Hutson & Son, Kelvinhaugh Engine Works. The christening ceremony was performed by Miss Darling, Bonally, Helensburgh.

J. Leyman.—On June 30th Messrs. Mackie & Thomson launched from their yard at Govan the steam trawler *J. Leyman*, which they have built for Messrs. J. Leyman & Co., Hull. Dimensions—Length, 109½ ft.; breadth, 21 ft.; depth, 12 ft. moulded. The vessel [illegible] fitted by M[illegible] & Houston with triple-expa[illegible]

20 in., and 32 in. respectively and a stroke of 24 in. Miss Florence Leyman, daughter of the owner, performed the naming ceremony.

Donna Lucia.—On June 30th Messrs. J. M. Lambie & Son, boatbuilders, Greenock, launched a fine steam yacht, built to the order of Mr. Joseph W. Russell, Esplanade, Greenock. The yacht, which is 50 ft. 6 in. in length, 9 ft. 9 in. beam, and 5 ft. in depth, moulded, is to be fitted with surface-condensing engines and return tube-boilers by Messrs. Bailey, Portsmouth. She is built of Oregon pine, and has been named the *Donna Lucia*.

Volga.—On July 7th there was launched from the yard of Messrs. John Reid & Co., Limited, Whiteinch, a screw steam yacht of 100 tons, namel *Volga*, for Mr. R. K. Holms-Kerr, of Underbank, Largs. The machinery has been supplied and fitted by Messrs. Hall-Brown, Buttery & Co., Govan.

Conway.—On July 8th there was launched by Messrs. Archd. M'Millan & Son, Limited, at Dumbarton, a steel sailing vessel of about 2,000 tons register, which has been built to the order of Messrs. R. N. Smith & Co., Liverpool. The ceremony of naming the ship *Conway* was performed by Mrs. Hume, of Llanberis, North Wales, wife of Captain Hume, who is to command the vessel.

Clutha No. 11.—On July 9th Messrs. Russell & Co. launched the first of the *Clutha* twin-screw steamers, Nos. 11 and 12, for passenger traffic on the river. Their principal dimensions are:—Length, 90 ft. over all; breadth, 17 ft.; depth, moulded, 8 ft. 6 in.; while they register 48 tons, and are 82 tons gross. They are each supplied with two sets compound surface condensing engines, by Messrs. Muir & Houston, Glasgow, and are supplied with steam by one boiler of 120 lbs. working pressure. The steamers are of superior finish, having a common saloon and lavatories aft, with handsome smoking saloon forward, in teakwood. They are built to Lloyd's highest class for river purposes, and will be launched complete, with steam up. They are expected to attain a speed of 10 knots an hour.

Fleetwing and Redwing.—On July 10th Messrs. Mackie & Thomson launched at Govan two steam line fishing boats—the *Fleetwing* and the *Redwing*—which they have built to the order of the Caithness Steam Line Fishing Co., Limited. The dimensions of each are:—Length, between perpendiculars, 95 ft.; over all, 102 ft.; extreme breadth, 19 ft. 9 in.; moulded depth, 10 ft. 9 in.; tonnage, 135 gross. High-pressure compound engines, having cylinders of 13½ in. and 30 in. diameter respectively, and a stroke of 21 in., will be supplied by Messrs. Muir & Houston.

Canning.—On July 13th Messrs. David and William Henderson & Co. launched at Partick on the Clyde a large screw steamer, which they have built for Messrs. Lamport & Holt. This is the sixth steamer they have built for the same owners during the past twelve months, and she, like her predecessors, will be employed in the trade between Glasgow and Liverpool and Chili and Peru. The dimensions of this latest addition to Messrs. Lamport & Holt's extensive fleet are as follows:—Length, 440 ft.; breadth, 52 ft.; depth, 31½ ft.; with a gross tonnage of about 5,350 tons. The machinery consists of a set of triple-expansion engines, with cylinders 29¼ in., 47 in., and 78 in. diameter by 60 in. stroke, and three large double-ended boilers with Howden's forced draught. The ship and machinery take Lloyd's highest class, and during construction have been under the inspection, on behalf of the owners, of Mr. John Russell for the hull, and Mr. Morrin and Mr. Thomson for the machinery. She was named *Canning*.

Ammon.—On July 14th Messrs. Charles Connell & Co., Whiteinch, launched from their Scotstoun shipbuilding yard, a steel-screw steamer, built to the order of the "Kosmos" Co., Hamburg. Her dimensions are:—Length, 370 ft.; breadth, 46 ft. 6 in.; depth, moulded, 30 ft., with a deadweight capacity of about 6,200 tons. She has been built to the highest class in English and German Lloyds, and is fitted with all the most recent appliances for the safety and efficient working of the vessel. She is handsomely fitted up for a number of first, second, and third class passengers, together with accommodation for about 60 emigrants. The engines, which are of the most improved quadruple-expansion type, having cylinders 21¼ in., 31½ in., 45 in., and 64 in. by 45 in. stroke, worked by three single-ended boilers, are being constructed by Messrs. David Rowan & Son, engineers, Glasgow. As the steamer left the ways she was named *Ammon* by Mrs. Saggan, wife of Capt. Saggan, who has superintended the construction of the vessel.

Varuna.—On July 14th Messrs. A. & J. Inglis launched at Pointhouse, on the Clyde, the *Varuna*, a twin-screw steel steam yacht, which they have built for Mr. Eugene Higgins, New York. The vessel, which has been designed by Mr. G. L. Watson, is of 1,500 tons gross, and will be fitted by the builders with triple-expansion engines, expected to give a speed of about 16½ knots an hour. She is a splendid specimen of the latest type of steam yacht, and will be luxuriously furnished.

Minho.—On July 14th Messrs. R. Napier & Sons, Limited, launched from their shipbuilding yard, Govan, the second of three steel screw steamships they have on hand for the Royal Mail Steam Packet Co., London. These fine steamers have been specially designed to meet the requirements of the company's extra service to Brazil and the River Plate, and are intended to carry a large cargo, with comfortable accommodation for first class passengers and emigrants. The general dimensions are:—Length, 345 ft.; breadth, 44 ft.; depth, 27 ft., with a topgallant forecastle, long bridge, full poop, and a gross tonnage of about 3,300 tons. They are built of steel, to class 100 A1 at Lloyd's, under special survey, and are fitted in accordance with the Board of Trade regulations for passenger steamers. The upper deck and fittings are of teak, and the most modern appliances have been supplied for the efficient working of the ship and the rapid handling of cargo, including a complete installation of electric lighting and refrigerating machinery on the carbonic and anhydride system, with chambers of 7,700 cubic feet capacity for the transport of frozen meat, &c. Superior accommodation has been provided amidships for the first-class passengers, and as the ships are intended to trade in tropical climates the large and roomy state-rooms have been placed on the upper deck, which admits of perfect ventilation, and are furnished with all the latest improvements for the comfort of the passengers. Above, on the bridge deck, is a handsome dining-saloon, finished in polished hardwood, with large side lights; while overhead an awning deck affords admirable shelter, and the bridge deck forms a spacious promenade for the first-class passengers. Comfortable accommodation has been supplied for 700 emigrants on the main deck, with hospitals and a dispensary in the poop; while the officers' quarters have had special consideration bestowed on them. The machinery consists of a set of triple-expansion engines, with three steel boilers for a working pressure of 180 lbs., and fitted with the most modern appliances for efficiency and economy. The vessel was gracefully named the *Minho* by Mrs. Owen, wife of Capt. W. H. Owen, R.N.R., and after a successful launch was towed up the harbour to receive her machinery, which has been constructed at the builders' Lancefield Engine Works. The company adjourned to the model-room of the yard, where success to the ship and continued prosperity to the Royal Mail Steam Packet Co. was pledged.

Electra.—On July 14th Messrs. James and George Thomson, Limited, launched at Clydebank the torpedo-boat destroyer *Electra*, which they have designed and built to the order of the British Government. This is a sister ship to the *Brazen*, launched by the same company on July 4th, and is the second of four vessels ordered at the end of last year. These vessels are expected to attain a speed of 30 knots.

Lough Mahon.—On July 16th Messsrs. Fleming & Ferguson, Limited, shipbuilders, and engineers, Paisley, launched from their yard the *Lough Mahon*, a powerful steel self-propelling bucket-ladder dredger, constructed to the order of the Harbour Commissioners, Cork. Dimensions of the dredger are:—167 ft. by 33 ft. by 11 ft. 6 in. She will be capable of dredging to a depth of 35 ft., and to enable her to dredge close up to quay walls the bucket-ladder is not placed centrally, but at the side of the vessel. She is fitted with machinery of the most modern description, the gearing throughout being entirely of steel, with frictional power to prevent breakages in case of extraordinary strains. Independent engines are fitted for hoisting the bucket-ladder, and all the most recent improvements have been furnished for the expeditious handling of the vessel. The dredger has been constructed under the supervision of Mr. Geo. Macfarlane, naval architect and consulting engineer, Glasgow.

Steel Screw Steamer.—On July 16th Messrs. John Reid & Co., Limited, launched from their yard at Whiteinch, a steel screw steamer, propelled by twin screws, specially designed under the superintendence of Mr. Thomas Wardropper, of Ekaterinburg, for service on Lake Baikal, in Siberia. Mr. Nemtchinhoff, the owner, is a wealthy Russian merchant, and has already steamers running on this lake. The present vessel, which has a cellular double bottom throughout, is fitted mainly as a passenger vessel, and has a complete installation of electric lights in addition to the ordinary lamps. The steering-gear and windlass, by Messrs. Alley & MacLellan, are worked by direct steam, and all the other appliances are of the most improved description. The hull measures 115 ft. by 18 ft. by 9 ft., and has been fitted with two sets of triple-expansion engines and other machinery fitments by Messrs. Alley & Maclellan, engineers, Polmadie, through whom the contract was negotiated. Miss Alley, Langside House, Langside, named the vessel.

LAUNCHES.—Irish.

European.—On July 9th Messrs. Harland & Wolff launched at Belfast the large twin-screw steamer *European*, built to the order of the West India and Pacific Steamship Co., Limited. The vessel is 475 ft. in length, and her tonnage is about 3,180. Her machinery consists of two sets of triple-expansion engines, constructed by the builders. She is intended for the company's Liverpool and New Orleans service, and, with the exception of the sister ship *American*, launched last year by the same firm, she will be the largest cargo carrier in the trade.

Comic.—On June 9th the *Comic*, a steel steam vessel, of about 875 tons, was launched at Belfast, owned by the Belfast Steamship Co., Limited, of Belfast.

Antenor.—On June 11th the *Antenor*, a steel steam vessel, of about 4,800 tons, was launched at Belfast, owned by the Ocean Co.

LAUNCHES.—German.

Carl.—On June 20th a steel three-masted schooner, of about 446 tons, named the *Carl*, was launched at Bremerhaven, owned by Seebren Gebruder, Hamburg.

Aachen.—On July 7th a steel steam trawler, named the *Aachen*, was launched at Vegesack; owned by the Dampf Finherei Gesellschaft Nordsee, Bremen.

Alster.—On July 8th there was launched from the shipbuilding yard of Messrs. Joh. C. Tecklenborg, Geestemunde, a steel screw steamer, built to the order of Mr. A. Kirsten, Hamburg, to be employed in the coasting trade, especially between Hamburg, Rotterdam and London. Her dimensions are as follows:—Length, 55 m.; breadth, 8 m.; depth, 4·39 m. The vessel has a double cellular bottom for water ballast, long poop of 34 m. length and forecastle; her deadweight capacity is about 1,000 tons. Her engines, also constructed by Messrs. Tecklenborg & Co., are of the triple-expansion type and indicate 400 H.P., designed to give her a speed of 10 knots. She was named the *Alster*.

LAUNCHES.—Norwegian.

Habil.—On May 7th a steel steam schooner, named the *Habil*, was launched at Stavanger; owned by Holdt and Isaachsen.

Sivert Nielsen.—On June 1st a steel steam schooner, named the *Sivert Nielsen*, was launched at Trondhjem; owned by Saltel Damskibselskab, Bodo.

LAUNCH.—Danish.

Gunther.—On July 4th the *Gunther*, built to the order of the Steam Navigation Co. of Hamburg, was launched at the yard of the Elsinore Iron Shipbuilding and Engineering Co., Elsinore, Denmark. This steamer is built of steel to the highest class at German Lloyd, and her dimensions are 240 ft. by 34 ft., by 15 ft. 10 in. depth of hold. The engines are of the triple-expansion type, with surface condenser, indicating 600 H.P.

LAUNCH.—Dutch.

Paramaribo.—On July 4th a steel steamer, of about 500 tons, named the *Paramaribo*, was launched at Amsterdam; owned by the Dutch Government.

TRIAL TRIPS.

Tutanekai.—On Tuesday, June 23rd, the twin-screw steamer *Tutanekai* ran her official trial trip on the measured mile at Skelmorlie, when over the contract speed of 14 knots was obtained. She has been built and engined by Messrs. David J. Dunlop & Co., Inch Works, Port-Glasgow, for the Government of New Zealand, and whilst being specially designed and constructed for cable laying and repairing purposes, having two large circular cable tanks and all necessary appliances for cable laying and lifting, the steamer has been fitted up and furnished also with a view to carry the lighthouse keepers and their families to and from the various stations in the colony; attending to buoy work being also part of her duties. Accommodation of a most superior description has been provided for his Excellency the Governor-General and his suite, and for the members of the Legislative Council. The cable machinery and all fittings in connection with the cable work, has been supplied by Messrs. Johnson & Phillips, Old Charlton. A complete installation of electric light has been fitted throughout by Messrs. W. and J. Robinson & Co., Limited, of London and Liverpool, on the "Concentric" system. Spacious staterooms, dining saloon, and other apartments are fitted up amidships of solid oak, mahogany and walnut, giving a pleasing effect to the various places; each stateroom has been supplied with a Hoskin's patent folding-up metallic bed and woven-wire spring mattress, Smith's patent fold-up lavatory, &c. All floors are covered with Brussels carpet and the sofas and chairs are handsomely upholstered in blue velvets. All the upholstery work of the vessel has been supplied and executed by Messrs. Wylie & Lochhead, Limited, Glasgow, in their usual handsome and efficient manner. Immediately over the saloon is a large steel deckhouse, with inside framing of solid oak, containing companion and stairway to saloon, ladies' cabin, captain's cabin, and cable testing room, and also spacious well, with teak skylight on bridge deck, communicating light and ventilation to saloon below. The officers are accommodated under the bridge amidships, and also under the raised quarter deck aft, where there is a handsome dining saloon for their use, fitted up in solid oak, and immediately overhead is a large teak deck-house containing smoking room and companion panelled in solid oak, and upholstered in leather. Accommodation is provided forward for the conveyance of lighthouse-keepers and their families, with separate cabin for ladies, all comfortably fitted up with berths, dining tables, settees, &c.; and forward of this is the accommodation for the stokers, while the seamen are berthed under the forecastle; all these places are handsomely and comfortably fitted up. The dimensions of the steamer are:—Length (between perpendiculars), 205 ft.; breadth, 30 ft.; depth, (moulded), 15 ft. 9 in., and she has been built throughout of steel, and to Lloyd's 100 A1 class, under special survey, and she also fulfils the requirements of the Board of Trade for passenger steamers. The vessel carries four fully equipped boats, two of them being whale lifeboats 35 ft. long, all of which were contructed by Mr. Robert Rodger, Port-Glasgow, and they have also been supplied with Hill's patent boat disengaging gear for promptly lowering the boats into the water. The internal fittings and working appliances of the steamer are amply provided for and have been furnished by some of the best makers. They include Hall's patent anchors, and cable outfit by Messrs. N. Hingley & Sons, of Dudley; steam and hand-steering gear by Messrs. Davis & Co., London, with screw gear by Messrs Napier & Sons, Glasgow, who also fitted a powerful capstan-windlass, winches were provided by Messrs. Clarke, Chapman & Co. The outfit of nautical instruments was provided by Messrs. A. Dobbie & Son, Glasgow, and comprise among the list two of Lord Kelvin's patent compasses, and also one of his patent sounding machines. The machinery consists of two sets of triple-expansion engines, having cylinders 15½ in., 25 in. and 40 in. diameter, with a stroke of 30 in., and two marine tubular single-ended boilers, having a working pressure of 170 lbs. per square inch. An auxiliary boiler, for a pressure of 170 lbs., has also been supplied by builders. The engine-room gear and outfit is most complete, and includes separate circulating pumps for each engine, and a system of assisted or forced draught on the builders' plan of inclosed ashpits. The whole of the cable gear and fittings is portable, and will only be carried when the vessel is actually employed on telegraph work. The steamer has been designed and constructed under the direct superintendence of W. H. Preece, Esq., C.B., engineer-in-chief of H.M telegraphs, and W. R. Culley, Esq., submarine superintendent of H.M. telegraphs, the large experience of the latter in the arrangement and various details required in this class of vessel and in submarine cable work generally, rendered his assistance in the preparing of all plans and in the carrying out of the work most valuable. Mr. R. S. Hubbard ably fulfilled the duties of resident inspector. During the trials the machinery worked with perfect smoothness, with entire absence of heating, no appreciable vibration, and the results reflect great credit on the builders for the care and judgment they have shown in the fulfilment of this contract. Messrs. Dunlop have had previous experience in this class of work, having built H.M. telegraph ship *Monarch*, and the experience gained by them assisted them in carrying the present contract to a successful issue. At the official trial a large company of ladies and gentlemen joined the steamer at Gourock and after the vessel had finished her runs on the mile, a pleasure cruise as far as the island of Arran was thoroughly enjoyed by all on board, and as many of the guests were strangers to these waters, the scenery of the Firth of Clyde was spoken of in terms of admiration. The Agent-General for New Zealand was unavoidably detained in London and could not be present at the trial, but amongst the company were W. H. Preece, Esq., C.B., Mr. and Mrs. Culley, Dr. Fischer, Under Secretary of State; G.P.O., Berlin, Hon. W. C. Smith, of New Zealand and party; Mr. Stewart, Superintendent Engineer of Post Office Telegraphs, Glasgow; Mrs. and Miss Baird, Glasgow, Professor and Mrs. Bottomley, Professor Jamieson, Mr. Croft, of London, Mr. Williams, Misses Baird, Miss Thomson, Mr. and Mrs. Wylie, Mr. and Mrs. Ross, Miss Dunlop, Captain Fairchild, Mr. Bethume, chief engineer, Mr. Hubbard and others. Mr. Fairchild, who has lately arrived from the colonies for the purpose of navigating the *Tutanekai* to New Zealand, is an officer of great experience. He has been for over thirty years in the service of the New Zealand Government, and enjoys the confidence and esteem of those who have dealings with him. After drydocking for the purpose of having bottom repainted, the *Tutanekai* sails for New Zealand in the course of a few days.

Duchess of York.—On June 24th the saloon paddle-steamer *Duchess of York*, built and engined by Barclay, Curle & Co., Limited, Whiteinch, Glasgow, for the Southampton, Isle of Wight, and South of England Royal Mail Steam Packet Co., Limited, went for her trial trip. Her dimensions are—185 ft. by 22 ft. by 8 ft. 9 in., and she measures about 250 tons gross. She is fitted with compound diagonal engines, with high-pressure cylinder of 24 in. diameter, and low-pressure cylinder of 45 in. diameter with 54 in stroke. The first-class passengers are accommodated in a handsome deck saloon abaft the machinery space, with ladies' cabin on the main deck, and a commodious dining saloon has been arranged underneath, with bar, pantries, steam carving tables, &c. A large teak deck-house is fitted on the hurricane deck for a smoking-room and a protection over the saloon companion way. The saloon for the second-class is fitted forward below the main deck and a second-class ladies' cabin is fitted on the paddle wings. The *Duchess of York* is the thirteenth steamer built and engined by Barclay, Curle & Co., Limited, for this company, and is fitted and finished with all the most recent appliances and improvements for the comfort and safety of passengers. Mr. Alex. Brown, the marine superintendent of the Southampton and Isle of Wight Royal Mail Co., represented the owners, and Messrs. Jas. Gilchrist and Wm. Russell Ferguson, the builders, on the trial, which passed off in a very satisfactory manner, a mean speed of 14·86 knots being attained on the measured mile at Skelmorlie, or fully three-quarters of a knot over the speed guaranteed.

Zero.—On June 26th the *Zero*, built by Messrs. Earle's Shipbuilding and Engineering Co. for the Wilson Line, Hull, went for her official trial trip. Being specially designed and built for the Copenhagen butter and provision trade, speed is an important object, and the mean of 13 knots realised on the measured mile was considered quite satisfactory. She is 250 ft. long, 30 ft. beam, by 18 ft. moulded depth, and for the purpose of bringing over such perishable cargo in good condition during the summer months, the *Zero* has been fitted with Hall's refrigerating machinery. Captain Leach was in command of the vessel, and Messrs. Wilson's party included Mr. C. H. W. Wilson, Captain Malet, their new marine superintendent, Mr. J. Spear, superintendent engineer, and Messrs. Moorby and Bishop, Earle's Co. being represented by Mr. Frank H. Pearson and Mr. D. Douglas.

Speedy II.—The new steam yacht *Speedy II.*, recently built by Messrs. Ramage & Ferguson, Limited, Leith, for the Baron Barreto, of Brandon Park, which, from the novelty of the design has excited some interest in yachting circles, and about whose probable sea-going powers many heads were wagged and many predictions hazarded, arrived at Bergen on June 26th, and it is satisfactory to learn that the "comfortable house boat" has given a good account of herself on her passage across the North Sea, and appears to be quite a small triumph of scientific shipbuilding, for in addition to the guarantees of draught of water, trim, stability and speed which her knowing owner imposed on the builders and which have all been fulfilled, she is with her twin screws, water-tube boilers, patent feed heater, patent ash conveyor, electric light and large luxurious cabins, an Atlantic liner on a small scale. The yacht left Peterhead in a strong breeze of N.N.E. wind and averaged 10 knots for the first six hours, after which the wind freshened to a gale with a very high sea. All sail was set and a good nine knots was maintained. The vessel carried sail well and neither the tenderness, nor the excessive rolling predicted—rather contradictory forecasts by the way—were apparent. The sea performance of this vessel will probably recommend this type of yacht to owners who like large airy deck cabins and a perfect shelter in wet weather. Now that the stokers have learned to work the boilers no difficulty was experienced in maintaining steam, while the engines worked perfectly all the voyage. Thirteen tons of coal steamed the vessel 296 miles. On her speed trials recently the yacht steamed 11½ knots on the mile and 11 knots on a five-hours sea run.

Albertville. — On Tuesday morning, June 30th, the Belgian Royal Mail steamer *Albertville*, which has been an object of attraction for some time past in Middlesbrough Dock, proceeded to sea on her official trial. The *Albertville* has been built by Messrs. Sir Raylton Dixon & Co. to the order of Messrs. Elder, Dempster & Co., of Liverpool, for the Compagnie Belge Maritime du Congo, of Antwerp, and is intended for the line running with the mails and passengers from that port to the Congo and the West Coast of Africa. Her dimensions are:—Length, 364 ft.; breadth, 44 ft.; depth, 26 ft., and she is a very handsome model, of yacht-like appearance, and built with fine lines to maintain a good rate of speed. The *Albertville* is the most elaborately fitted and decorated vessel that has left the Tees, and is specially arranged for the comfort of passengers in a very hot climate. Her decks are all of East India teak, and a poop and bridge, of over 250 ft. in length and 8 ft. high, is devoted entirely to cabin accommodation. There are also three large houses above this for the first-class dining-saloon, first-class smoking-room and second-class smoking-room, and cabin entrance. Over the dining-saloon house, and alongside engine and boiler casing, a teak shade deck extends to the sides of the vessel, so as to give protection from the sun, and this deck also forms a specious passenger promenade under a protecting awning. The captain's cabin and steering house are both upon this deck, and over them again is the navigating bridge of the vessel. The cabins are entered by a spacious entrance hall, panelled in carved walnut and inlaid wood of very artistic design, with sofa seats and small tables, and in the centre of the roomy staircase to the cabins below is hung a beautiful oil portrait of the Crown Prince of the Belgians. The dining-saloon is arranged to accommodate over 108 passengers, with a number of small dining tables, so that the passengers can arrange themselves in private parties. This saloon is most elaborately panelled in marble of various colours, with woodwork of beautifully carved mahogany, the fittings being of copper bronze, the whole having a most artistic effect. A piano is placed at the end of the saloon, and both oil and electric lamps are fitted throughout. The staterooms are situated in the poop below, with a wide corridor extending up the centre, having an open-grated sliding door in front so as to obtain splendid ventilation, iron doors also being fitted so that this can be closed in bad weather. A separate ladies' saloon is very handsomely fitted, and all the bathroom and sanitary arrangements are of the most complete description, the baths being of porcelain, and the floors and sides of the rooms covered with encaustic tiles. The second-class saloon is placed aft, being panelled in teak and enamel, with tables and revolving chairs to accommodate sixty passengers. The smoke-rooms on deck are very tastefully fitted and panelled in carved oak.

The ship is lighted throughout by the electric light, and is also provided with refrigerating machinery and a large cooling chamber for the conveyance of fresh meat, provisions, &c. In fact, no expense has been spared to complete her in the most perfect way in every detail. Her engines, of 2,000 H.P., have been made by Messrs. Thomas Richardson & Sons, Limited, of Hartlepool, and the trial in every way proved satisfactory. The vessel then proceeded direct to Antwerp, where she loaded and sailed with the Belgian mails on July 6th.

Parmelia.—On July 1st the new hopper dredger *Parmelia*, recently constructed for the Western Australian Government by Messrs. William Simons & Co., Limited, Renfrew, underwent her dredging and steaming trials with very satisfactory results. It has a capacity in its hoppers for 470 tons of dredgings, and when tried at Greenock dredging, she loaded at the rate of 800 tons per hour. The dredger afterwards steamed down the Firth of Clyde, when a trial of her speed took place, and it was found that a speed greatly in excess of the contract was obtained, which was considered highly satisfactory.

Alette.—The screw steamer *Alette*, built to the order of Mr. C. W. Nordin, of Paris, by Messrs. Wm. Gray & Co., Limited, of West Hartlepool, has now completed her trial trips. The vessel ran round to Blyth from Hartlepool to take in her first cargo, and having taken on board some 5,000 tons deadweight, she proceeded on Saturday, July 4th, from Blyth to take a loaded trial on the measured mile off Whitley, which trial was performed in a most satisfactory manner. The engines ran admirably throughout, and at a steady speed of 66 revolutions per minute. There being an absence of current, the unusual result occurred that out of three runs over the mile in alternate directions the vessel passed the mile within a second of the same time on each occasion, giving a speed of precisely 10 knots per hour, the weather at the time being very gusty, with squalls of rain and considerable swell. There were on board the owner, Mr. Nordin, Mr. Drakenberg, Mr. Charlton, Mr. Thompson, Mr. and Mrs. Waterburgh, Dr. Bruxells, Captain Anderston, Captain Stenfeldt, Mr. Thomas Mudd, representing the builders of the engines, and others, all of whom were much gratified with the result of the trial, and with the manner in which the work had been carried out, both in the ship and engine departments of Wm. Gray & Co., Limited. The *Alette* is commanded by Captain Stenfeldt, who has spent several years of his life commanding a vessel on the Congo. After landing her passengers at the mouth of the Tyne, the vessel proceeded late in the day on her voyage to Cronstadt, and after discharging her coal cargo she will take in her first load of timber at the Swedish ports for Rouen. The vessel is a noteworthy one, inasmuch as she has several special features adapting her to a special trade —that of carrying long timber. She is 336 ft. in length, 48 ft. in breadth, and 24 ft. 2 in. deep, and is fitted with a long bridge and short topgallant forecastle. The holds are fitted with exceptionally large hatchways, very deep framing with web frames and web beams, so as to dispense entirely with the obstruction of beams and pillars, and thus adapt them to the special timber trade in which the vessel is to run. These features are somewhat novel in a ship of this large size, and enables the *Alette* to take a leading position in the timber-carrying trade. The decks carry seven powerful steam winches, as well as steam steering gear amidships, and hand steering gear aft. The engines are of the well-known triple-expansion type, manufactured at the Central Marine Engine Works of Wm. Gray & Co., Limited, and have cylinders 24 in., 38 in., and 64 in. in diameter respectively, with a piston stroke of 42 in. They are supplied with steam at 160 lbs. working pressure by two exceptionally large boilers of the type regularly manufactured at these works, viz., with the shell plates welded at the corners of their seams and flanged to receive flat end plates, which method makes so excellent a job and avoids the troubles that are incident to the method of flanging the end plates. The high pressure engine is jacketed at full boiler pressure, and the engines generally are of the design tested a year or two ago by Professor Kennedy in the s.s. *Iona* with such excellent results. The steam reversing gear is placed on the condenser, where it is entirely out of the way, and the hand wheel is on the front of the engines near the starting handles. It is perfectly easy with this gear for one man to reverse the engines from full speed ahead to full speed astern in five seconds, and he can start the engines without any risk of the reversal of the orders from the bridge, owing to the three-pointer arrangement. The oiling of the working parts of the engines is also automatically carried out on Messrs. Carl Andersen & Bloms system, and there is one of Mr. Mudd's patent evaporators for supplying the supplementary feed. The machinery throughout is thoroughly up-to-date, and has, together with the vessel, been constructed under the careful and continuous supervision of Mr. Jean Drakenberg, of Stockholm, and Mr. Thompson, of Messrs. Charlton & Thompson, Sunderland.

Spero.—On July 4th the new steamer *Spero*, built by Messrs. Archibald M'Millan & Son, Limited, Dumbarton, for Messrs. Thomas Wilson, Sons & Co., Limited, Hull, went down the Firth on her trial trip. The weather was rather stormy, but, notwithstanding this, a speed of 12½ knots was obtained. The dimensions of the vessel are 250 ft. by 30 ft. by 18 ft. 1½ in. She has been built for Messrs. Wilsons' passenger and general carrying trade between Stettin and Hull. The engines are of the triple-expansion type, and have been supplied by Messrs. Muir & Houston, Limited, of Glasgow. Both hull and machinery have been constructed to the British Corporation class and Board of Trade passenger requirements.

Juanita North.—On July 4th this steamer, which was built by Messrs. Short Brothers, at Sunderland, went out on her trial trip with satisfactory results. After adjusting compasses the vessel was taken a series of runs over the measured mile, when a mean speed of 13¾ knots was obtained, the engines running with smoothness and absence of vibration. This vessel, which is constructed of steel, to the highest class in Lloyd's rules, for the Nitrate Producers Steamship Co., Limited, of which Messrs. Lawther, Latter & Co., of London, are the managers, is of the following dimensions:—Length, 352 ft.; breadth, 45 ft.; and depth, moulded, 27 ft. 9 in.; with a deadweight capacity of 5,600 tons. The engines, which have been supplied by Messrs. George Clark, Limited, Sunderland, have cylinders of 24½ in., 40 in., and 66 in., with a stroke of 45 in. There are two large steel boilers, having a working pressure of 180 lbs., and fitted with Howden's system of forced draught. During construction the vessel has been under the superintendence of Captain J. W. Squance, and is in command of Captain Perry.

Restauracion.—On July 6th the twin-screw gunboat *Restauracion*, of 563 tons, built by Messrs. Napier, Shanks & Bell, Yoker, for SanDomingo, to the order of Messrs. Frame, Alston & Co., London, went on her trial trip with a large company on board. This is the second vessel built by Napier, Shank & Bell for the same owners, and, like the earlier one, the *Independence*, built in 1894, the *Restauracion* proved a complete success, a speed of nearly 15 knots being obtained on the measured mile. The vessel is armed with nine quick-firing guns by Hotchkiss, all of which were on board. There is a complete installation of electric lighting, steam windlass and steering gear, and the president's quarters are elaborately fitted up. The vessel is propelled by a pair of triple-expansion engines, with large boiler fitted on the forced draught principle by Dunsmuir & Jackson, Govan. Mr. Shanks occupied the chair at luncheon, served on deck under an awning, when the usual toasts were proposed. After "The Queen," the toast of "His Excellency the President of San Domingo" was proposed and drunk with enthusiasm. The chairman then gave the *Restauracion*, to which Mr. Frame gracefully replied.

Kirkham.—On July 7th the twin-screw hopper barge *Kirkham*, built by Messrs. Murdoch & Murray, Port-Glasgow, and the machinery by Messrs. Rankin & Blackmore, Greenock, underwent a series of tests on the Clyde as to capacity, draught and speed with satisfactory results. Starting at 10 a.m. from the East India Harbour, the vessel proceeded to Bowling, where her hoppers were filled with 330 tons of dredged material. Thereafter a run was made to Skelmorlie, where the "mile" was accomplished at the average rate of nine knots per hour, without pressing to fulfil the requirements of a very exacting specification drawn up, as well as the plans, by the Lancashire and Yorkshire and London and North-Western Railway Co.'s superintending engineers at Fleetwood, Mr. G. P. Muloch, C.E., and Mr. A. T. Gibson, M.E. These gentlemen, assisted by Captain Bond and Mr. Skeoch, supervised the construction of the *Kirkham*. This most recent addition to the Fleetwood flotilla is a sister ship to the *Blackpool* and *Lytham*, built by the same firms about two years ago, and her chief dimensions are—Length, 136 ft.; breadth, 25 ft.; and depth of hold, 9 ft. 6 in. The vessel is constructed of steel, and is divided into five watertight compartments by stiff bulkheads. The main engines have been constructed on Rankin's patent principle, and are the eighth set ordered by the Lancashire and Yorkshire, and London and North-Western Railway Co's. The cylinders are four in number—9 in., 9 in., 18 in., and 32 in. respectively in diameter, all having a piston stroke of 22 in. Steam at 160 lbs. pressure is generated by a return-tubular boiler.

Rosemount.—On July 8th the new steel screw steamer *Rosemount*, built by Messrs. Wood, Skinner & Co., of Bill Quay-on-Tyne, to the order of the Quebec Steamship Co., Montreal, was taken on her official trial trip over the measured mile off the Tyne. This vessel is the first of her class built on the Tyne, being intended for service on the Canadian lakes. The vessel is 245 ft. in length, 41 ft. in width, with a moulded depth of 14 ft. an exceptionally light draught being essential owing to the trade in which she will be engaged. Her engines, built by the North-Eastern Marine Engineering Co., Limited, Sunderland, are of the latest type, the cylinders being 20½ in., 34 in., and 57 in., with a 39 in. stroke. Steam is supplied by two large multitubular boilers, working at a pressure of 180 lbs. The steamer went through a series of tests with much credit to the builders and engineers, an average speed of 11 knots being obtained, and the machinery working smoothly. The vessel left the Tyne the same evening for Montreal.

Neptune.—On Thursday, July 9th, the s.s. *Neptune*, a fine steel screw steamer which has just been completed, to the order of Mr. John Lockie, of Newcastle-on-Tyne for the newly formed "Venus" Steamship Co., by C. S. Swan & Hunter, Limited, of Wallsend, was taken to sea for her trial trip. The *Neptune* is one of the most recently designed types of spar-deck steamers, suitable for carrying large deadweight as well as measurement cargoes. Her leading dimensions are:—330 ft. between perpendiculars by 45 ft. 3 in., by 28 ft. 9 in. moulded, and she has been designed to carry 5,600 tons deadweight on a moderate draught, or about 6,700 tons of measurement cargo, in addition to bunkers. The accommodation for captain and officers is arranged on the spar-deck and is ample and comfortable; whilst the crew are berthed, as usual, under the topgallant forecastle. The deck machinery is of the latest type, consisting of powerful steam winches, steam steering gear, steam windlass, fresh water distilling apparatus, the latest type of stockless anchors, &c. The propelling machinery has been constructed by the North Eastern Marine Engineering Co., and consists of a set of engines with cylinders 24 in., 40 in., and 64 in by 42 in., with two extra-large steel boilers, constructed under special survey; whilst for convenience of long voyage trading the steamer has been supplied with a full equipment of spare gear. On proceeding to sea the *Neptune* had on board about 700 tons of bunkers and 800 tons of ballast, and after adjustment of compasses she proceeded to the measured mile, where the mean of a series of runs was at the rate of over 10 knots per hour, the engines working smoothly and without a hitch of any description, the performance being considered by all to be highly satisfactory. The builders were represented on the trial trip by Mr. Rowland Hodge, one of the managers, the engine builders being represented by Mr. Summers Hunter. The managing owner, Mr. John Lockie, was unfortunately unable to be present, but was represented by Mr. William Stevenson, his marine superintendent, who has surveyed the vessel during construction. On completing her trial the *Neptune* sailed at once for Montreal, under the command of Captain John Allan, where she will load again for the United Kingdom.

Atlantic.—On Saturday, July 11th, the fine large steel screw steamer *Atlantic* had her trial trip. She is the fourth and largest vessel built by Messrs. Wm. Gray & Co., Limited, for Messrs. W. H. Cockerline & Co., Hull, and will form part of the same fleet as the *Pacific*, *Graphic*, and *Majestic*. The vessel takes Lloyd's highest class, and is of the following dimensions:—Length, over all, 336 ft.; breadth, 47 ft.; and depth, 24 ft. 10 in. The deck erections consist of a full poop, long bridge, and topgallant forecastle. Triple-expansion engines of the Central Marine Engine Works' well-known type have been fitted in the vessel. They will develop over 1,200 H.P., the cylinders being 24 in., 38 in., and 64 in. in diameter respectively, with a piston stroke of 42 in., and steam is supplied by two large steel boilers working at a pressure of 160 lbs. per square inch. The *Atlantic* went to sea early in the morning, and had her compasses adjusted by the time the tug took off the owners and their visitors at 10 o'clock. There were present: Mr. W. H. Cockerline and Mr. Woodhead, of Hull; Mr. Strong, superintendent engineer, under whose superintendence the vessel and her machinery have been constructed; Mr. Penn, of Cardiff; Captain Murrell and Mr. T. Mudd, representing the builders of the ship and engines respectively. The weather was fine, and a good run was made over about three hours at full speed to test the running qualities of the engines, everything being found to run in perfect order, an ample supply of steam being maintained with the engines making 78 revolutions per minute. The vessel averaged 10½ knots per hour. The owner and his representatives expressed their satisfaction at the manner in which the contract had been carried out, both in the shipyard and engineering departments, and on the completion of the trial the vessel proceeded to Riga to load her first cargo.

Clutha No. 11.—On Saturday, July 11th, the *Clutha No.* 11, the first of the pair of new river passenger steamers recently launched by Messrs. Russel & Co., Port-Glasgow, for the Clyde Navigation Trust, went down the Firth on her trial trip. The new boat is so nearly similar to those at present in the service of the Trust as to render a detailed description unnecessary. Her general features are the same, but there is all over a noticeable improvement in regard to accommodation and working arrangements. The fore cabin, instead of being confined and comparatively unventilated, is large and airy and has windows above, which open under the deck seats and entirely prevent stuffiness in the room below. The cabin is nicely got up and is decorated with pictures, mostly landscapes and marine views. The smoking-cabin aft is somewhat less pretentious, but is considerably above the style of the same rooms on any of the older boats. The machinery and mode of working follow the same lines as those which have been so successful on the other *Cluthas*. The trials were run over the measured mile at Skelmorlie, and a speed of 9½ knots per hour was attained. This, remembering that the wind and tide were against the boat, was considered very satisfactory. The *Clutha* returned to Gourock, where the party were landed, and the vessel then proceeded up the river to Glasgow.

Golden Fleece.—On July 11th the trial trip of the steamer *Golden Fleece*, which has just received very extensive alterations at the hands of the Blyth Shipbuilding Co., who have converted this vessel from an ordinary cattle-carrying boat into one of the finest and largest fruit carriers of the day, is intended for the fruit trade between the West Indies and New York, took place between Blyth and the Tyne. She is a steamer 320 ft. long by 35 ft. beam by 26 ft. depth of hold. As is well-known, the question of ventilating the holds is one of paramount importance in fruit steamers; and a new arrangement has been adopted in this vessel whereby all the air in the holds is renewed in less than one minute, and arranged in such a manner that a continuous current of air sweeps the holds from one side to another, so that no stagnant air can lodge in any particular place. Those who are acquainted with the trouble of ventilating ships are best able to comprehend what this means, and the difficulties which have had to be surmounted. The complete ventilation of the holds has been affected partly by mechanical means and partly by utilising the waste heat from the boilers, thus reducing the cost of such installations, which in this case deals with over 60,000 cubic feet of air per minute, and is believed to be the largest quantity of air dealt with in a ship up to the present date. This large quantity of air is further utilised in a form of forced accelerated draught for the boiler furnaces, thus increasing the evaporative power of the boilers, and consequently the H.P. of the machinery, or what is equivalent, increasing the speed of the steamer. In addition to the above, one of the holds has been fitted with a refrigerating plant on the ammonia system, which will be capable of keeping the temperature down so as to prevent the overheating of the fruit. Messrs. Clarke, Chapman, & Co. have fitted a complete system of electric light installation, both for the ship's use, passenger accommodation, and working of the holds. The alterations made in the main engines by the engineering establishment of the Blyth Shipbuilding Co. have been of such an extensive character as to increase the speed of the vessel by 1½ knots over anything she has ever done before, while at the same time the alterations have tended to a very material reduction in the consumption of the fuel at former speeds. The speed which was obtained at the trial gave the owners and a large party of invited guests unqualified satisfaction. The whole of the alterations above referred to, including the system of ventilation adopted in this vessel, has been made to the designs of Mr. George Walker, consulting engineer and naval architect, of London, under whose superintendence the work has been carried out.

Steel Screw Tug.—On July 14th the third of four steel screw tugs for Portland, which Messrs. Fleming & Ferguson, Limited, Paisley, are constructing for the Admiralty, underwent her speed trials on the Clyde, and maintained a speed of about a knot in excess of that specified. The trials were watched on behalf of the Admiralty by Messrs. Stewart & Scoggins.

Sussex.—On July 14th the twin-screw steamer *Sussex*, built by Messrs. Wm. Denny & Brothers, of Dumbarton, for the London, Brighton, and South Coast Railway Co.'s service between Newhaven and Dieppe, was put through an exhaustive series of trials on the Clyde. The mean speed on the Skelmorlie mile was found to be 20·4 knots per hour, which was considered eminently satisfactory. It is unnecessary to describe this vessel here, as she is practically a repeat of the well-known *Seaford*, constructed by the same builders, and which, it will be remembered, was lost through collision in the Channel in August last. This is the fifth vessel constructed by the builders for the same owners.

Moorby.—On July 17th the s.s. *Moorby*, lately completed by Messrs. Ropner & Son, of Stockton-on-Tees, to the order of Messrs. R. Ropner & Co., West Hartlepool, left the river Tees for her official trial trip. On the arrival of the vessel in the Tees Bay her compasses were duly adjusted, after which a very satisfactory run was made, the machinery working very effectively and easily.

Taquary.—On Saturday, July 25th, the s.s. *Taquary*, the first of two sister steamers constructed at the Cleveland Dockyards of Sir Raylton Dixon & Co. for the Hamburg Sud-Amerikanische Dampfschiff-fahrts Gesellschaft, was taken out to sea for her official trial trip under the command of Captain Evers. The vessel is of the spar deck type, and built to Bureau Veritas highest class, under the supervision of Mr. F. G. Dietze, and has been specially designed and fitted to meet the requirements of the company, passengers, and general trade to Rio Grande. Her principal dimensions are:—Length, 310 ft. 6 in.; beam, 41 ft. 2 in.; depth, moulded 26 ft.; with a deadweight carrying capacity of about 3,960 tons. The first-class passenger accommodation is fitted up under the bridge, with dining-saloon in house on bridge deck. Commodious and well ventilated quarters for about 326 emigrants are also provided aft in poop and between decks. The decks are sheathed with teak and all the fittings and accommodation are of a particularly complete and first-rate description. Triple-expansion engines have been fitted by Messrs. Thomas Richardson & Sons, Limited, Hartlepool, having cylinders 20 in., 33 in., 57 in. by 45 in. stroke, supplied with steam by two large boilers working at 205 lbs. pressure. At the conclusion of the trials, which were very successful and satisfactory, the vessel proceeded to Hamburg to load for South America.

Institution of Naval Architects.—We are informed that the Council have resolved to hold the next summer meetings of the Institution in London towards the end of June, or the beginning of July, 1897. It is the intention of the Council on this occasion to invite to London, to take part in the meetings, their hosts of the last two years in France and Germany, who, by their magnificent hospitality and kind feeling, have done so much for the advancement of the Institution. The Council feel that the Institution is under a heavy debt of gratitude to these gentlemen, and it is aware that it is the universal wish of the members that every effort should be made to give them a worthy reception in this country. With this object in view a large and influential reception committee has been formed, consisting of the Council of the Institution, and of others who are not on the Council, but who occupy representative positions in London, and in the various seaports and industrial centres of this country. It has been resolved as a first step, on the suggestion of numerous members of the Institution, to invite, forthwith, subscriptions towards a fund for defraying the special expenses of the reception. It is impossible, at this early date, to give any exact indication of the character of the programme which will be drawn up for the summer meetings of 1897; but it may be mentioned that every effort is being made to interest the most influential circles in the success of these meetings, and to secure the reading of papers which will be in every respect worthy of the occasion.

Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships, from June 11th, to July 9th, 1896.

12758	H. M. L. Crovan. Motive power engine, &c.
12767	H. V. Holden. Casting armour-plates, &c.
12778	W. Ullrich and F. Biesecke. Vehicles and boats.
12795	E. J. Clubbe, A. W. Southey, and the Electric Motive Power Co., Ltd. Engines.
12817	T. A. Kennedy. Steering ships.
12822	J. G. Whittles, S. H. Ogden and S. Douglas. Rotary engines.
12839	W. Evans. Propelling steam ships.
12867	D. H. Williams. Valve gear for steam engines.
12885	F. W. Marriott. Log for recording speed.
12910	C. Kellner. Steam boiling apparatus.
12939	O. Robinson, J. Whitelegg, R. F. C. Tonge, and J. Butterworth. Pressure intensifiers.
12965	J. Norfolk. Taking the bridles of trawl nets.
12979	E. Blass. Welding furnaces.
13004	E. B. Caird and T. J. Rayner. Discharge valve.
13005	J. Brunlees and J. Walker. Multitubular boilers.
13008	E. Jones. Covering for steam pipes.
13014	J. and G. Day. Diving apparatus.
13043	T. P. Rennoldson. Steam engines.
13123	H. B. and J. S. Watson. Water gauge fittings for high-pressure boilers.
13175	W. Geipel. Steam traps.
13176	A. Belleni. Reflecting telemeter for vessels.
13179	E. J. Clubbe, A. W. Southey, and the Electric Motive Power Co., Ltd. Lubricating cylinders.
13231	J. S. and J. Jennens. Water gauges.
13235	Z. J. Parkes. Stokers for firing boilers.
13252	W. E. Prall, jun. Rotary engines.
13315	C. C. S. Knap. Water-tube steam boilers.
13323	W. N. Dack. Water-tube boilers, &c.
13333	O. Abraham and H. Meisel. Engines, &c.
13336	J. T. Dickinson. Ships' hawse pipes.
13340	F. W. Thorpe. Expansion valve gears, &c.
13349	E. P. Davis. Fire-bars for boiler furnaces.
13410	E. Empain. Steam generators.
13443	E. Hodges. Valve.
13454	J. Hudson. Tubes.
13507	C. F. Rutterford and F. Beauchamp. Engines.
13509	G. Shenton (F. Gros, France). Steam generators.
13549	F. W. Crossley and J. Atkinson. Internal combustion engines.
13560	F. E. Gripper. Petroleum engines.
13571	J. Apsey and F. B. Hill. Promoting combustion in steam boiler furnaces.
13572	J. A. Clément and G. J. J. Caton. Promoting combustion in steam boiler furnaces.
13596	C. Stimpson. Hydraulic rotary engines.
13604	H. H. Lake (La Société de Traction électrique sur les Voies Navigables, France). Towing vessels.
13639	W. Schmidt. Cylinders of steam engines.
13647	A. Seaton and W. W. Willatt. Telegraphs for ships.
13650	W. S. Simpson. Manufacture of tubes.
13691	H. H. Lake (Société de Traction électrique sur les Voies Navigables, France). Propelling vessels.
13702	F. P. Plenty, jun., and J. W. Davis. Steam generator.
13706	J. M. Ross. Speed gear.
13720	W. B. Avery. Steel yards.
13732	C. Koerte. Direct-acting steam pumps.
13738	G. H. Fish. Steam vacuum pumps.
13739	B. J. B. Mills (B. A. Fiske, United States). Speed indicator for shafts.
13752	J. S. Gisborne. Mariner's compass.
13753	T. Cooper. Self-moving steam engines.
13778	C. Schneider. Steam valves.
13785	W. Wilkinson and G. Sellers. Steam boilers.
13793	R. J. F. Mostyn. Internal combustion engines.
13829	L. W. Parker. Lubricators.
13845	T. E. Stephens. Screw propellers.
13852	A. F. Hall. Direct acting engines, &c.
13864	H. Audin. Engines.

13900 F. S. Smith. Wrenches.
13932 J. I. Cox. Anchors.
13960 F. W. Lanchester. Motive power engines.
13967 H. W. Ludlow. Seamless steamer.
13978 F. E. Darker and J. Favets. Steam generators.
13979 W. T. M. Dobson. Preventing the sinking of ships.
14008 W. E. Forstl. Means for lubricating bearings.
14016 W. J. S. Barber-Starkey. Sounding apparatus.
14026 W. W. Horn (N. W. French, United States). Screw propellers.
14056 B. J. Hicks and E. F. Bach. Lubricating composition.
14066 R. T. Napier. Steam winches, &c.
14069 R. S. Richards. Furnaces of steam generators.
14082 W. Payton. Piston-valves for motive power engines.
14116 H. Müller. Buoys for salvage purposes.
14119 T. B. Heathorn. Propellers.
14127 E. D. Watkins and T. Lowther. Valves.
14148 A. Thomson. Doors for bulkheads, &c.
14154 J. Smith. Propeller for oarless boat.
14169 F. E. Shean. Compartments of merchant ships.
14175 T. Pattinson and T. Slater. Valve gearing for steam engines.
14177 E. Davies and H. M. H. Goodfellow. Velocipede boats.
14255 J. Scott. Boards for trawling apparatus.
14261 J. Penn. Cranks.
14269 F. W. Zimer. Propelling boats.
14285 E. R. Down. Cylinders.
14290 E. F. Sargeant. Manufacture of belting.
14299 H. H. Lake (A. J. Bruce, United States.) Gauges.
14330 A. G. Brown. Tubes.
14385 J. Wescott. Valve gear for steam engines.
14432 G. A. Robertson. Steam turbines.
14457 F. T. Woodson. Adjustable wrenches, &c.
14459 H. J. Lawson. Improved portable engines.
14465 W. T. Chamberlain and C. B. Beebe. Petroleum burning furnace.
14467 J. A. Calantarients. Measuring the depth of the sea.
14536 E. J. Solomon. Arresting sparks from funnels.
14538 J. Mace. Slide valves.
14543 A. McWilliam. Ship's steering gear.
14577 H. S. Lane. Band for masts.
14640 T. Armstrong. A pneumatic life-buoy.
14661 J. Heathcote (D. Jones, New Zealand). Launching ships' boats.
14672 M. Gledhill. Manufacture of armour plates.
14675 D. Davy. Friction gear.
14683 F. Krefft. Vessel propeller.
14692 H. Grafton (W. R. Grafton, Egypt). Steam generators.
14721 J. W. Smith and C. Hannay. Coverings for steam pipes.
14739 H. T. Liversedge. Water-tube boilers.
14747 W. J. Pitt. Rotary engines, turbines, &c.
14748 W. M. Nurse and J. Englishmann. Bronzing engines.
14751 P. A. Newton (A. Nobel, France). Armour plates.
14775 W. R. Wills. Steam generators.
14797 R. Patrick. Water-tube boilers.
14799 C. Hamilton. Ship's signal light indicator.
14800 F. Crossley. Removing or replacing pistons.
14844 S. S. Bromhead (A. Vosmaer, Netherlands). Opening and closing valves.
14856 T. Sheldon and J. Trantom. Steam motors.
14857 H. Pilkington. Manufacture of steel.
14861 W. R. Wills. Steam generators.
14868 L. M. G. Delaunay-Belleville. Steam generators.
14881 G. Rockliffe. Eye plates for ships' doors.
14883 H. J. J. L. and J. B. L. Monteith. Cranks.
14891 W. B. Thompson. Ships' davits.
14906 P. Pinckney. Boilers.
14918 W. C. Foy. Boat.
14925 J. N. and W. Paxman and J. C. Peache. Expansion gear.
14959 F. L. Merritt. Internal combustion engines.
14971 A. Bremberg. Watertight doors.
14982 A. and H. Normanton. Oars and paddles.
15001 T. Moodie. Closing watertight doors in ships.
15025 R. Marshall. Down-draught furnaces.
15027 E. L. S. Power. Hook for boat-lowering gear.
15082 D. S Hawks. Lifeboats.
15098 Palatine Engineering Company, Limited, and R. Blakiston. Measuring flow of fluids.
15113 W. Shedlock. Supplying feed-water to boilers.
15126 A. G. Melhuish. Cooling cylinders of engines.
15190 D. Short. Injector for steam boilers.
15206 A. Cotton and L. W. G. Flynt. Fire-bars.

BOARD OF TRADE EXAMINATIONS.

NOTE.—1C denotes First Class; 2C, Second Class.

June 27th, 1896.		
Allerton, T. H.	2C	Liverpool
Anderson, J. R.	1C	S'nd'land
Appleyard, W. H.	2C	London
Bateman, W. G.	2C	Hull
Batt, G. H.....	2C	London
Brown, W. A...	1C	N.Shields
Clarke, P. C. ..	2C	Liverpool
Crute, G. H. S.	2C	S'nd'land
Davies, A......	2C	Liverpool
Dawson, J. M...	2C	Aberdeen
Denton, H.	1C	London
Fairbairn, W. H.	1C	Liverpool
Fyfe, R.	2C	Aberdeen
Hockney, R.....	1C	Hull
Hogg, T.	1C	S'nd'land
Humphreys, G.	1C	Liverpool
Isaacs, W. A. ..	1C	,,
Jack, J. W.....	1C	S'nd'land
Jenkin, F. E. ..	2C	Hull
Kerr, J.........	2C	N.Shields
Lardeur, G. F.	1C	London
Leary, J.	1C	Aberdeen
Lowden, J.	2C	,,
Miller, J. W. ..	2C	N.Shields
Munro, D. P. ..	1C	Aberdeen
Pedder, D.	2C	London
Richards, H. M.	2C	,,
Rioch, R. J.....	2C	S'nd'land
Robinson, W. J.	2C	,,
Ross, R.	2C	N.Shields
Rutherford, F.	2C	Liverpool
Salkeld, J. D. ..	1C	N.Shields
Snow, H. W. ..	1C	Liverpool
Swaffield, N. ..	1C	London
Swinton, R.....	1C	S'nd'land
Thomson, J. ..	1C	London
Walker, J.	2C	Aberdeen
Walker, L. A...	2C	Leith
Williams, W. ..	2C	London
July 4th, 1896.		
Anderson, R. A.	1C	Glasgow
Bryden, Thomas	1C	Liverpool
Craig, A.	1C	Glasgow
Davies, D.	2C	Cardiff
Daw, W. H.....	2C	,,
Escott, A. R. S.	2C	,,
Henderson, J...	2C	Glasgow
Hinde, W. D. ..	2C	London
Jarvie, H. M. ..	2C	Glasgow
Jeenes, F. W. ..	1C	Cardiff
Jones, J. H.....	1C	London
Leopard, T. T.	2C	Glasgow
Lister, G. R. ..	1C	London
McCallum, W...	2C	Glasgow
McGregor, J. J.	2C	,,
Mee, C. A.	1C	Cardiff
Meredith, W. S.	2C	,,
Mindo, A. W. ..	2C	London
Pearson, J. H...	2C	Cardiff
Rayner, T.	2C	,,
Riddell, W. G.	1C	Glasgow
Rowland, W. ..	2C	Cardiff
Russell, J. T. ..	1C	Glasgow
Shepherd, A. W.	2C	Cardiff
Sheriff, T.	1C	Glasgow
Smith, B. F. ..	2C	London
Soulsby, R. A.	2C	Cardiff
Young, G. A. ..	2C	Glasgow
July 11th, 1896.		
Boyd, G.	1C	London
Bryson, J.	1C	Leith
Clark, J. S.	2C	N.Shields
Cribbes, T.	2C	Leith
Dennant, C.....	2C	London
Finlayson, R. ..	2C	,,
Kehoe, J. J.....	2C	,,
Lecoustre, R. ..	2C	Liverpool
McDevitt, Wm.	2C	L'd'nd'ry
Muir, A. P.....	2C	N.Shields
Tucker, R.	1C	,,
Westwater, H.	2C	Leith
July 18th, 1896.		
Arnott, W.	2C	Greenock
Barclay, D. S...	1C	,,
Clare, W. P.....	2C	N.Shields
Davidson, C. J.	1C	London
Dettmer, H. W.	2C	N.Shields
Ferguson, M. P.	1C	Greenock
Fitzgerald, J. C.	1C	,,
Gentles, T.	2C	,,
Gibson, C. L. B.	2C	London
Hirons, W.	2C	,,
Jack, J.........	2C	Liverpool
Mackechnie, R.	1C	Greenock
Mair, W. H.....	2C	,,
McKivett, J. ..	2C	,,
McLennan, W.	2C	Liverpool
Murdoch, F. T.	2C	Greenock
Nicholson, G. B.	2C	N.Shields
Ormond, J. G...	2C	Liverpool
Peters, T. E. ..	2C	,,
Stirling, W.....	2C	Greenock
Thomson, C. ..	2C	,,
Tutton, W. E...	2C	London
Watters, W. ..	1C	Greenock

Iron and Steel Institute.—The meetings of this Institute will be held at Bilbao on September 1st, 2nd, 3rd, and 4th. On the 5th the members will leave for San Sebastien, staying there about fifty hours, and on Tuesday, the 7th, they will visit the French seaside resort, St. Jean de Luz, where a couple of days will be spent. From there they will leave for London, arriving on Saturday, September 12th. The Orient Co.'s s.s. *Ormuz* has been detailed to convey the members to Spain, and to serve as a "floating hotel."

Bitumastic Enamel.—Messrs. Wailes, Dove & Co., of St. Nicholas' Buildings, Newcastle-on-Tyne, have been commissioned to coat with their well-known "Bitumastic Enamel" the interior steel surfaces of three large vessels, building by Messrs. Harland & Wolff, Belfast, for the Cunard Co. The firm have also received orders to coat the vessels building by Messrs. Palmer for the Hamburg-American Co.

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MARINE ENGINEERS

WRITE

To the United States Metallic Packing Company, Ltd.,
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FOR MARINE CATALOGUE (A).

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The Marine Engineer.

LONDON, SEPTEMBER 1, 1896.

FRANCE is tired of being so far behind in maritime supremacy, and is now, through one of her ingenious sons, M. Bazin, making a tall bid to revolutionize naval architecture and to develop sea-going speeds as yet undreamt of by our slow-going naval architects and engineers. A practical steamboat on wheels of 274 tons has at last been launched by M. Ernest Bazin from the works of the Cail Company, St. Denis, near Paris, and is being towed down to Rouen for her engines and boilers, after which she is to cross the channel and electrify us by arriving in London by the Thames. This is not the first time we have heard of M. Bazin's invention, as a model was constructed by him in 1894, and we heartily congratulate him that at last his extraordinary invention is to be put to a practical test if it is only to prevent our old-established shipbuilders and designers from further wasting their valuable time and energies upon ocean greyhounds and magnificent liners which are now regarded by our enlightened neighbours as out of date and obsolete. The theories advanced by Mons. Bazin are enticing and specious, and it may be only prejudiced ignorance on our part that we cannot at once see the certain revolution of all the present accepted theories of ship construction. It is well known that rolling contact between relatively moving surfaces offers less resistance to motion than sliding contact, so far at least as the laws of frictional contact of solids go, but, on the other hand, we remember to have heard that at one time it was proved to demonstration that, where sliding surfaces were floated upon one another by injected hydraulic pressure, the frictional resistance was reduced to at any rate as little as rolling friction, which must eventually be met as sliding friction on the axles of the rollers or wheels. We should like to be sure that Mons. Bazin has fully considered this point: that however much he may reduce frictional sliding contact between the elevated superstructure of his vessel and the water, he has introduced a new element of friction in the fact that the whole weight of his superstructure, engines and boilers, are mounted upon axles frictionally turning in axle boxes, of which there are apparently twelve, distributed over his six supporting rolling drums. If, also, he considers the question of surface skin friction between a vessel and the supporting water, it is to be presumed that the immersed area of his supporting drums or wheels must at least be equal to the immersed area of an ordinary ship of equal tonnage, and though he speaks of rolling upon the water, the necessary immersion of his drums must be considerable, of which the forward portions are all descending through the water and the rear portions ascending out of the water with considerable entraining of, and friction with, the water. Mons. Bazin apparently considers the main resistance of a ship passing through the water is due to the thrusting or forcing aside of the water by the hull rather than to the surface skin friction, but as the re-entering angles of the counter are equivalent to the expanding angles of the bow, we always understood that the late Professor Froude considered that the essential resistance to motion of a vessel through the sea was a question essentially of skin friction rather than the thrusting aside of the water. Unless the advantages obtained by Mons. Bazin in the greater speed obtained by less effort are most marked, we cannot imagine that any sailors or passengers will be disposed to meet the tossing and strife of angry billows upon a platform certain to be swept from stem to stern, mounted on its substructure of rollers. However, we have no doubt that such an eccentric structure will be greeted with delighted curiosity by the sight-seers of the metropolis, and that she might make an excellent thing of it by taking tourists to Margate and back in fine weather.

THE chaos into which the relations between apprentices and employers in the engineering trades, owing to the old system of seven years' apprenticeship having fallen into desuetude, is well emphasised by the publication of a Parliamentary paper containing copy of correspondence between the Board of Trade and the representative societies of shipowners and others upon the subject of apprenticeship for applicants for Board of Trade certificates of competency as marine engineers. This question has been agitated, and the voluminous opinions thereon obtained have been published and circulated as a consequence of the energetic labours of Mr. Fortescue Flannery, M.P., in the matter. The present unsatisfactory condition of apprenticeship has no doubt arisen from the fact that the increasing complicity of marine engine fittings to modern steamers, the introduction therein of modern scientific appliances, such as complete instalments of electric plant for lighting and other purposes, has created a demand for marine engineers of much greater technical and scientific knowledge than were produced by the old system of seven years' workshop experience. As a consequence, the demand for technical education has had a tendency to so reduce the workshop apprenticeship in handicraft, such as to three years, that it has apparently been found that the handicraft skill of apprentices so trained is not sufficient to properly direct the work of skilled artificers, or to enable the engineers when rated to take their practical share upon emergency in such work. We know of no position where a thoroughly reliable handicraft skill in the engineers in charge is more wanted than in the certificated engineering staff of a modern steamship. The emergencies that may arise by the temporary breakdown of machinery or boilers when at sea, are so various, and of such serious consequences to the vessel, that an immense amount of experience in the emergency shifts of a limited workshop and the greatest handicraft skill both in the artificers and in those directing them are required to promptly deal with, and repair a sudden breakdown. The older generation of marine engineers with their lengthened practical training have proved themselves exceptionally resourceful and skilful in dealing with such emergencies, and the greater scientific and book knowledge of the more modern marine engineers will be dearly acquired at the expense of their handicraft ability. As a consequence, agitation has been set in movement for some time that a longer period than three years practical workshop experience shall be insisted on by the Board of Trade to qualify candidates for a certificate as a second engineer in the Mercantile Marine. The Sunderland and District Trades Council seem to have been the first corporate body, in 1893, to formally prefer the request for an extension of the term of workshop service from three to five years, and shortly after, the Institute of Marine Engineers passed a resolution in favour of this proposal. The Board of Trade, very properly perhaps, thought it right to obtain the opinion of shipowners, shipping societies, and engineer associations and firms upon the point, and circulated the above request and resolution amongst them, with the result of a large and almost unanimous approval of the proposition. It was thought, however, that such a change should be accompanied with an amendment of the existing regulations of workshop and sea service and the correspondence embodied in the Parliamentary paper before us contains the replies to such queries, and seem to be almost unanimously in favour of the regulation that at least five years' practical experience in workshops, drawing office and amongst marine engines should be insisted on by the Board of Trade for a second-class certificate, and that the addition of a third grade certificate would well meet the case where such increase of stringency in the second grade pass might unduly deter eligible candidates.

THE labour troubles at the docks are now beginning to bear fruit, which we are afraid will be bitter both to the employés and to the proprietor. The Peninsular and Oriental Co. are about to render themselves independent of the regulations of the Joint Committee of the London and India Docks, by erecting large wharfage just above Grays, and therefore several miles higher up the river than the Tilbury Docks. In pursuance of this purpose they have bought 4,000 feet river frontage, and on it they intend to construct a complete system of wharves and warehouses of the most modern type, suitable for the accommodation of the largest ships, including amongst other things refrigerating stores for dealing with the large supply of colonial produce brought by the P. and O. steamers from Australia. Sir Thomas Sutherland, together with several directors, have paid a visit to the site in order to make definite arrangements for the progress of the works, which will now be pushed forward promptly. It cannot be supposed that the Joint Committee have been so foolish as to drive some of their best customers away, unless under *force majeure*, from the arrangements necessary to meet the demands of the men, and the consequence now is that the P. and O. Company are "going to do without them." As in almost all great ports visited by the ships of the P. and O., the vessels are able to load and unload at wharves, &c., and the same system may be seen in active and successful operation in the Scheldt, at the magnificent quays of Antwerp, it need cause no surprise that a wealthy company like the P. and O. should endeavour to arrange complete independence of docks and the labour troubles that have so hampered them. After the great dock strike, certain arrangements were entered into between the shipowners and the dock companies, the effect of which, it was said, acted considerably in the favour of the dock companies. Since that time the complaint is that even with increased charges, the facilities offered by the dock companies have decreased, and the present state of things in the docks is regarded as something like chaos. Should this venture of the P. and O. prove successful and remunerative, it is probable that other large shipowners may follow their example, and it is evident that consequent upon such a revolution in the Port of London the dock labourers will have to face a decaying and dwindling business, and may be congratulated on the direful results of their organized efforts to interfere with business, and sicken their customers.

THE meeting of the Institution of Mechanical Engineers at Belfast, has passed off very successfully. Messrs. Harland & Wolff's magnificent shipbuilding and engine and boiler works were open to the members on two successive days, and they were glad largely to avail themselves of the privilege. A very large variety of the numerous industrial factories, including ropeworks, damask works, spinning works, distilleries, colour and printing works, were thrown open to the inspection of the visitors on two afternoons in the week, and there is no doubt that the advantages thus offered to the members of the Institution to inspect the leading factories of various industries is most valuable to them, and highly appreciated by them. A large number of interesting papers largely contributed by Belfast members, were read in the business forenoons of the week, and included papers on "Flax Scutching and Hackling Machinery," "Electric Lighting in Belfast," "Unusual Corrosion of Marine Machinery" (which we have pleasure in reporting in full), "Rope Driving," "Belfast Gas Works," "Descriptions of Alumina Works at Larne Harbour" and "Partially Immersed Screw-Propellers." There were the usual dinners, luncheons, and excursions by invitation, with conversazione and reception by the Right Honourable the Lord Mayor and the Lady Mayoress in the Free Library and Art Galleries, and thus as usual the meeting was most enjoyable and a most unequivocal success.

NOTES ON THE MAINTENANCE AND REPAIRS OF MARINE BOILERS.*

By J. F. Walliker.

ONE of the principal points to be considered in the paying life of a steamer is the boiler question, as care exercised in ordinary upkeep from the first becomes a marked factor when increase of years and adoption of newer types of vessels brings down to almost the vanishing point the necessary margin of profit which tempts the capitalist.

It may be specially interesting to note in this respect that on December 31st, 1895, the total number of steamers registered in Cardiff alone numbered 290, with a total tonnage of 183,900 registered tons.

In bringing forward for the consideration of the members a few points for discussion, founded principally on the writer's experience, it will not perhaps be necessary to say that the subject-matter is confined entirely to the present cylindrical type (or Scotch boiler) as, it is understood, that with few exceptions this is in universal use. Whether the future boiler of the mercantile marine is or is not to be of the water-tube pattern does not appear to be in any way settled. That this boiler is highly successful for certain classes of vessels is an undoubted fact, and one of the principal objections made to its adoption has been for some time done away with in the universal use in the best and most modern cargo boats of apparatus for supplying fresh water for auxiliary use. The working pressures of marine boilers is gradually getting higher and higher, and, as we appear to have nearly reached the limit of thickness in the flat plates of the present boiler, some modification in form will be necessary.

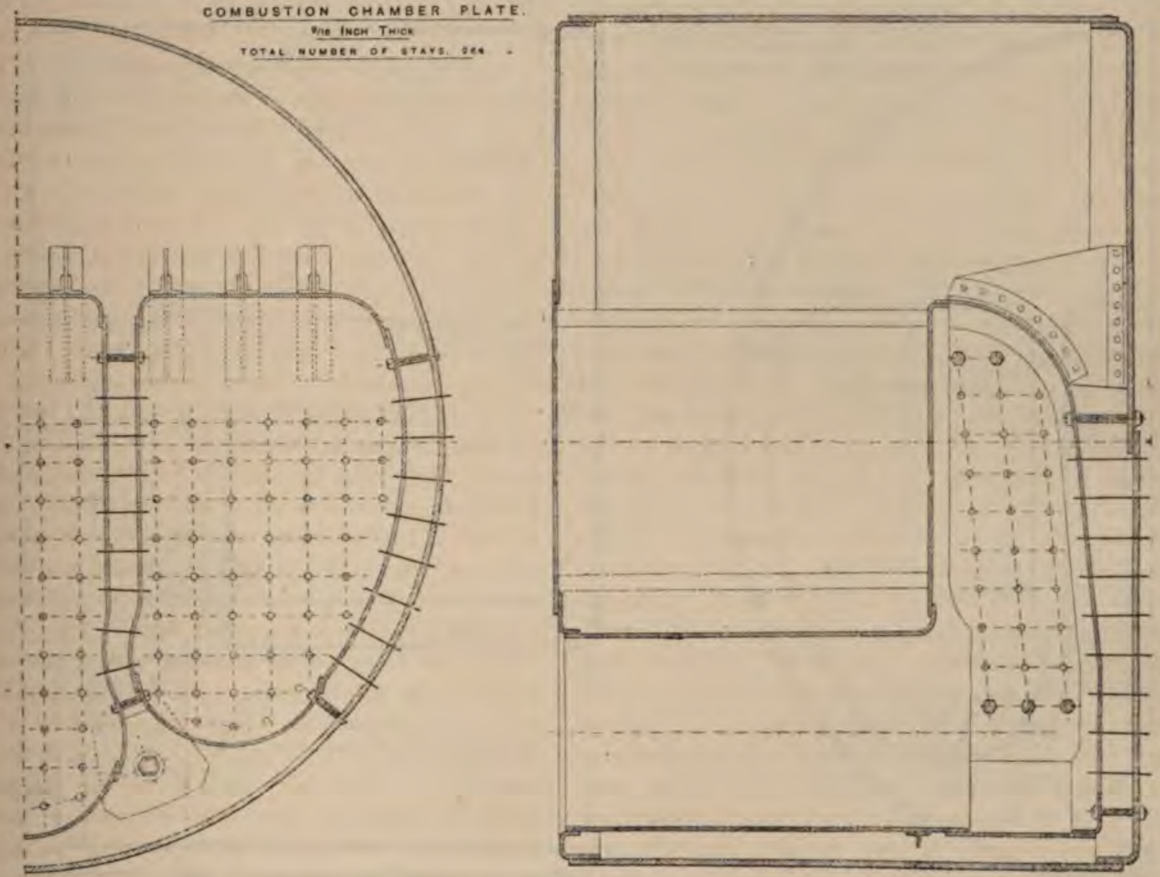

FIG. 1.

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* Read before the North-East Coast Institution of Engineers and Shipbuilders at their summer meeting in Cardiff.

The increase of pressure will be easily seen from the subjoined table, corrected up to the middle of last year:—

Table Showing Increase of Pressures in Main Boilers of Vessels Classed in Lloyd's Register in 1885 and 1895.

Boiler pressure.	No. of Vessels. 1885.	No. of Vessels. 1895.
Below 60 lbs....	122	40
60 lbs. to 70 lbs.	673	217
70 lbs. to 80 lbs.	1,326	666
80 lbs. to 90 lbs.	1,650	1,101
90 lbs to 100 lbs.	346	397
100 lbs. to 110 lbs.	102	321
110 lbs. to 150 lbs.	33	213
150 lbs. to 160 lbs.	34	517
160 lbs.	14	2,200
Above 160 lbs.	3	416

Before passing to the main question of maintenance and repairs, there appears to be two factors which have intimate relations with them, and which must assist or retard the ultimate success of the most careful and elaborate supervision, and these are *design* and *manufacture*.

Design.

Marine boilers are unfortunately often designed and placed in a vessel without due regard being paid to accessibility both of the exterior and interior parts, and that this is a crucial matter is too often shown after a long course of *necessary* neglect by the extensive repairs and renewals that are required. The writer would then place accessibility in the forefront of all boiler design; the heating and grate surface being allowed for, the boiler should be so made (and it can be made) that all its parts can be got at for cleaning and examination. What is usually seen in ill-designed boilers? Tubes and stays brought close to the furnace crowns and shell of boilers, stays placed in waterways, at the sides of mud-hole doors, &c.

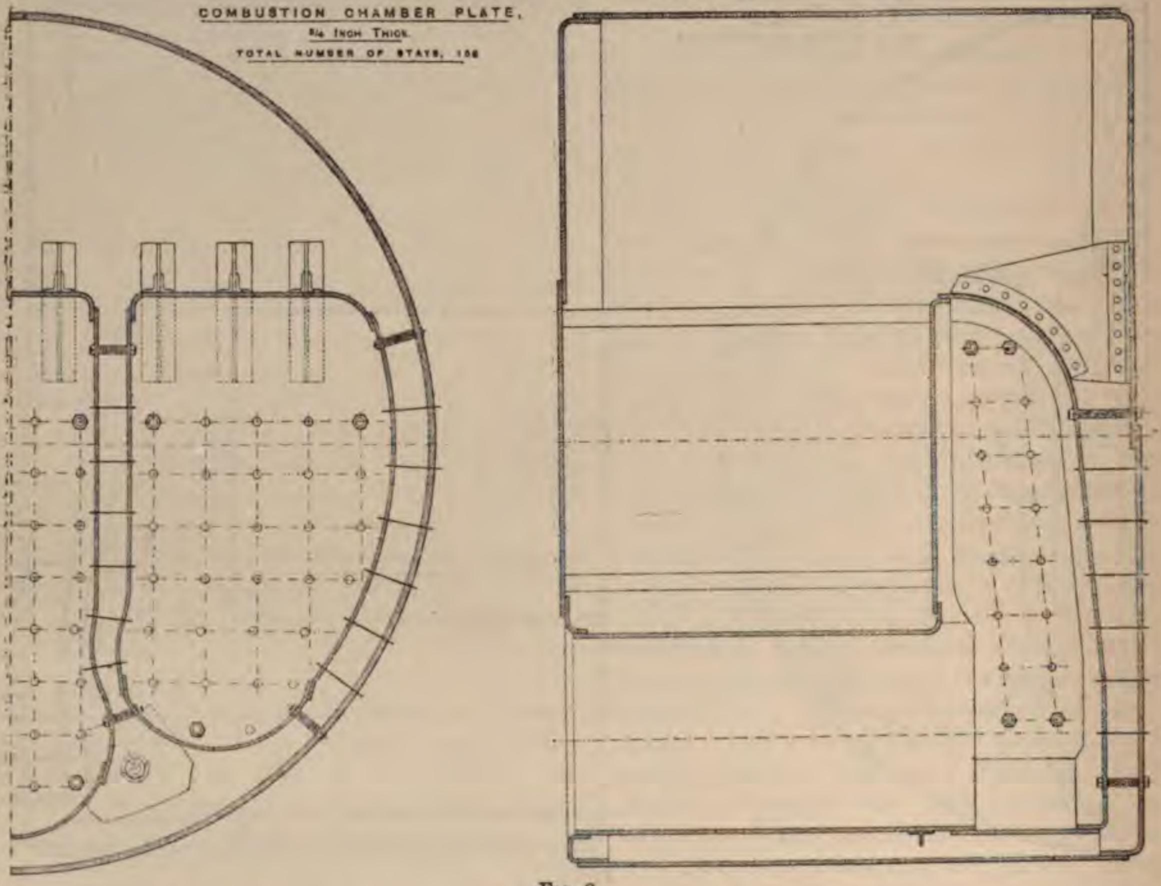


FIG. 2.

Wide spacing of stays at the combustion chamber back seems to be a point often omitted when designing a boiler, and there appears to be no reason why a limit of 9-16 or ⅝ in. should be imposed on a flat plate at this part when a ¾ in. one is in successful use in an equally hot or hotter part, viz., the furnace. The difference in the staying of this part with a 9-16 in. and a ¾ in. plate can be easily seen from the accompanying sketch (Figs. 1 and 2), which shows a marked difference in favour of the thicker plate; actually—264 stays with a 9-16 in. plate, and 156 stays with a ¾ in. plate.

Manufacture.

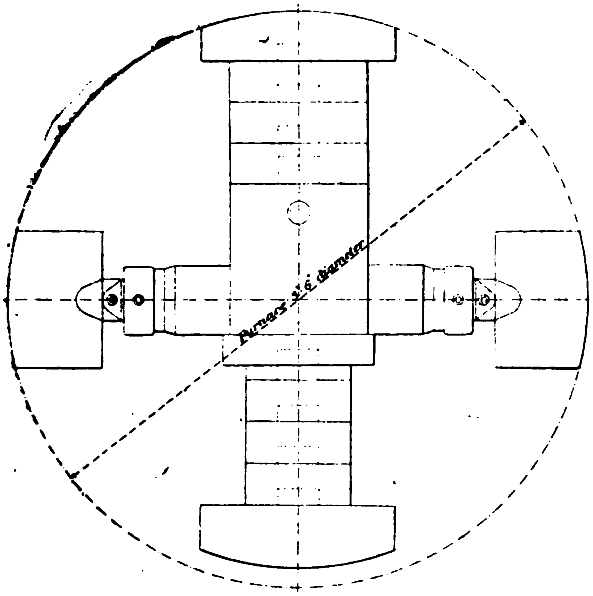
A very few words as to manufacture. The workmanship in the marine boiler has reached such a high state of general excellence that nothing but praise can be meted out when adverting to it. The use of plates of over 1⅜ in. in thickness and of a weight of some tons necessitates the nicest adjustment of parts in the workshop, and, indeed, boilermaking has almost become one of the fine arts in shop manipulation. The use of the hydraulic riveter and closer has done everything in this branch, and it is to their universal adoption that the high pressure boiler of the present day is a possibility and a success.

Management.

The superiority of the system upon which boilers of the present day are worked compared with that of fifteen or twenty years ago show enormous strides in the general condition in which they are found; at that time twelve years was usually looked upon as a good life for a marine boiler, and with the lighter scantlings, indifferent workmanship, and general want of knowledge in treatment this remark was more or less perfectly true. With, however, the present better knowledge it is not a bold assertion to make that thirty years will not be an excessive age, and more especially when it is remembered how many boilers of over eighteen years of age of the older type, and under the newer conditions of knowledge, are still in existence, and doing good work.

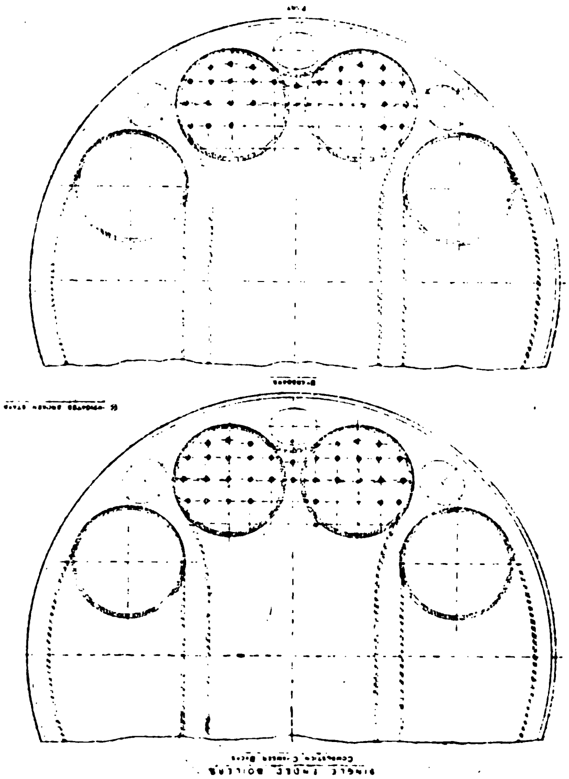
The chief items in internal deterioration are :—

1. Pitting and corrosion ;
2. Overheating of plates due to scale, &c. ; and consequent
3. Wasting ; and
4. Distortion.

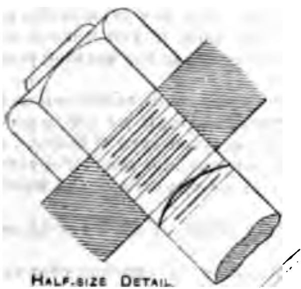


FURNACE JACK AND BLOCKS

FIG. 3.



G. 5



HALF-SIZE DETAIL SHOWING FRACTURE IN STAYS

DOUBLE ENDED BOILER.

SIX FURNACES

X INDICATES POSITION OF FRACTURED STAYS

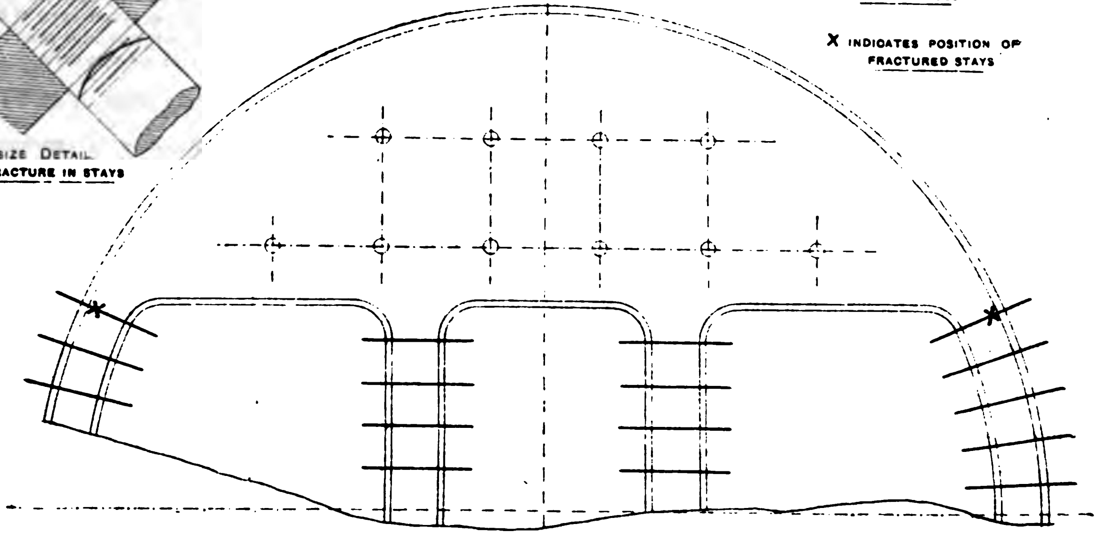


FIG. 4.

The chief factors in external deterioration are :—

1. Leaking at landing edges and rivets.

Application of Zinc and Soda.—The cause of pitting and corrosion has been discussed almost *ad nauseam* in every society taking an interest in boiler deterioration, but it is now a matter of universal knowledge that its harmful effects can be entirely obviated by cleanliness and care, and (*or*) by the use of zinc and common soda. These are applied under various patent designations, but the resultant is the same in lasting benefit to the boiler.

The almost entire disuse of oils to the pistons and valves engines has materially contributed to the interiors, and it cannot be too modern engine runs under the as a factor in the success of the water-tube boiler that the cylinders and valves of the engines are run without oil, but this system of only using the small portions passed in from the piston and other rods has long prevailed in many of our best cargo boats.

The evaporator has been already noted, and the advantages of its useful adjuncts, the feed heater and strainer, have also been fully discussed in papers read before the members of this Institution.

Maintenance and Repairs.

Setting Back Furnaces.—Among the numerous items of boiler repairs there have, unfortunately, still to be faced that of occasional distorted furnaces, and these, when found seriously out of shape, have to be dealt with either by replacing or by being forced back into their original shape. The usual procedure is to cross-stay the furnace at right angles to the direction in which the force has to be applied, properly support the *under* side of the furnace, and then restore to shape by pressure, going over the parts over and over again. Where the deflections have taken the form of pockets a hole has to be drilled in the centre for the gathering of the metal, and no difficulty has been experienced so far, even in very hopeless-looking cases. A hydraulic jack, with side arms and chocks, adapted to different diameters (Fig. 3) has been in successful use for some time, and it need not be added in this age of steel boilers that these operations are carried out without the aid of heaters.

Failure in Plates and Stays.—Some few years ago engineers were troubled with what were then considered mysterious cracks in shell plates of double-ended boilers, and also in combustion chambers. The origin of these has been fully investigated, and their causes well understood. Of more recent interest are the cases of fracture of short combustion chamber stays, generally occurring at the backs at bottom, and occasionally in double-ended boilers at the top row in the wings. Examples of these are shown in (Figs. 4 and 5), and the causes are apparently due to unequal expansion. It is to be noted in each case that the stays have broken off next to the shell, that they show no signs of elongation, that the fracture is nearly square, and that no further trouble has occurred after they had been once renewed.

Boiler Tubes.—A question has often arisen as to the condition in which the tubes of a boiler ought to be kept, whether it is better to let them run uncleaned or with the same care and attention bestowed on them as the furnaces, and the question being rather an interesting one, may be stated in the following way:—The percentage of tube surface in the heating surface of a boiler is about 85 per cent., and the effective heating surface 40 per cent.—allowing 30 per cent. for furnaces and 30 per cent. for combustion chambers, &c.

Now, if we take this at 20 per cent. instead of 40 per cent. what becomes of all this efficient heating surface when the tubes have from ¼ inch upwards of hard scale on them, and does it not seem to point to true economy in working to have this important boiler factor kept at its highest state of efficiency? With the more modern boiler this is beginning to be seen, but with few exceptions, the older type of boiler (and this the one too that can least afford it) is allowed to be neglected until the corrosion, which has all the time been at work under the scale, eats through the metal and causes delay and expense by a general total renewal of the tubes at the age of six years and upwards. The writer is cognisant of one firm of shipowners who consistently cleaned their tubes, and these small coasting vessels of 1,500 to 2,000 tons had never in one instance, up to a short time ago, retubed a single boiler, several of which had been running in continuous work over eighteen years.

Guards to End Plates.—A point that might be added with regard to end plate guards is the absolute necessity of having them either fitted altogether separate from the boiler end (which is the best practice), or so made that soot or other matter is unable to gather there to the serious detriment of the plate and contiguous stays. The whole of the deterioration observable in this part could, in the writer's opinion, be absolutely done away with by attention to this most necessary detail, and all wasting can invariably be traced to the presence of undue heat.

Auxiliary Boilers.—Speaking generally the principal wear noticeable in auxiliary or donkey boilers is due entirely to the effects of heat and damp on the shell, this being most noticeable in the cases of vertical boilers in stokeholds where the wasting is invariably to be found on the side next to the main boilers. The cure for this is so obvious that it would be unnecessary to mention it were it not for the fact that so many boilers are rapidly depreciating for the want of a little protection when out of use.

Boiler Covering.—It may seem out of the scope of this paper to mention tanks under boilers in connection with it, but it seems to have escaped general notice that it is as necessary to cover the *bottom* of a boiler as much as it is the *top*. It goes without saying that if a boiler could be kept perfectly cool that the extensive deterioration in tanks at this part would cease, and the proper and efficient covering of the shell at the bottom has made a marked improvement in the case of the steamers which have, so far, adopted it.

In conclusion, the writer would emphasise the absolute necessity of maintaining a high standard of excellence as one of the means by which we can continue to hold our maritime supremacy and the major portion of the carrying powers of the world.

MARINE BOILERS, PARTICULARLY IN REFERENCE TO EFFICIENCY OF COMBUSTION AND HIGHER STEAM PRESSURES.[*]

By J. R. FOTHERGILL, Vice-President.

As each year passes, the development in marine engineering so progresses, that at the present day we have reached that high standard of efficiency which makes it difficult to realise how further economy can be obtained without a material increase in the boiler pressure.

Past experience shows that no essential development in the marine engine has taken place without considerable hesitation, time to perfect detail and isolated trials proving beyond question such alterations were productive of economy. The introduction of the "compound," followed by the "triple," in each case took considerable time to develop before they became universal; the "quadruple" at the present day is quite the exception, and it is difficult to realise how it can become the accepted engine without a material increase in the working pressure.

Not only engineers, but shipowners are much concerned as to the solution of this problem, and particularly, if we are to go to higher pressures, what is to be the accepted type of boiler, nor need we be surprised at this when we consider the controversy taking place as to the various merits or demerits of the water-tube type.

Is this increase in pressure to take place, or are we to accept 180 to 200 lbs. as the limit?

Have we not at each marked increase in pressure over and over again heard the old argument, increased pressure means increased temperature with all the attendant difficulties, re-packings, oils, leaky joints, boiler troubles, &c., eloquently expounded, but of what avail? Is it not an inherent characteristic of the engineer to go ahead? One might as well try to push back the tide as prevent the engineer in his march of progress. Material progress cannot be made without failures, and well that it is so, for experience so gained builds up, as it were, a solid foundation on which to establish ultimate success.

The greatest difficulty in the past has been the manufacture of suitable boilers to meet the requirements of increased pressure. Demand and necessity for high quality material has been met by the energy and vigorous activity of the steel maker. Capable machines, suitable and able to deal with any thickness of plate and diameter of rivet, are obtainable, and the furnace manufacturers have kept well abreast of the times.

Although under these circumstances we can construct boilers with tightness and absolute safety to withstand any working pressure, yet we must not overlook the fact that a boiler has other functions than the mere certainty of being able to stand an enormous bottled-up pressure. It is of vital importance that a boiler should be considered an apparatus whose essential functions are—Evaporation and combustion; the rate of evaporation depending upon the efficiency of combustion and heat generated.

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[*] Read before the North-East Coast Institution of Engineers and Shipbuilders at their summer meeting in Cardiff.

We may reasonably assume increased boiler pressure looms in the near future, and although it is impossible to foresee to what pressures we may ultimately go, yet 250 to 280 lbs. may be considered within the bounds of probability, it thus becomes of the utmost importance to consider whether the present type of cylindrical return-tube boiler with circular furnaces is the most efficient as an apparatus for combustion, generation of heat, and transmission of that heat to the water.

It is freely admitted this type of boiler has been, and is, up to certain pressures, the most simple, the most "get-at-able" and serviceable marine boiler of any type introduced, but does this hold good for higher pressures?

The important objections seem to be weight, thickness of plate, particularly such places as are heating surface, heavy close staying, and especially small diameter of furnaces.

The writer is well aware small furnaces are occasionally used, but this is usually due to some peculiar necessity, and not from choice.

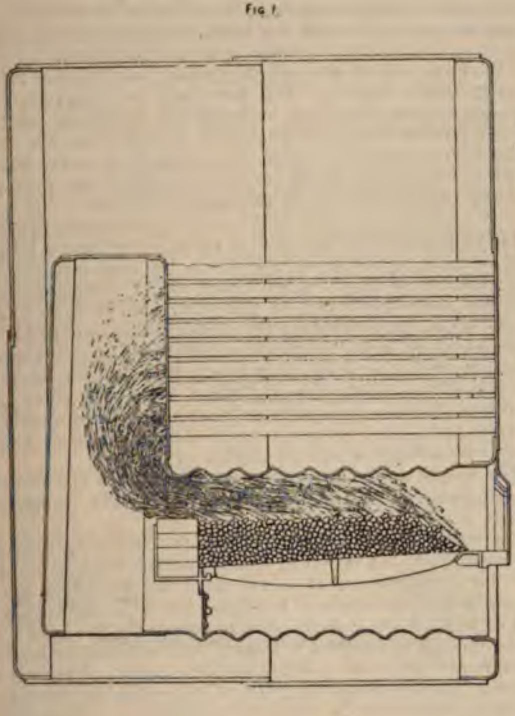

Fig. 1.

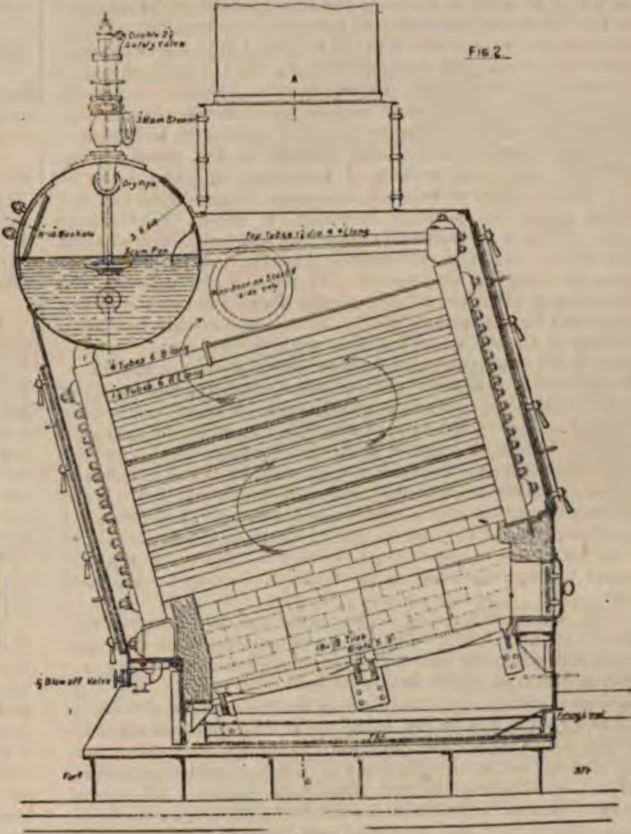

Fig. 2.

Neither the Board of Trade nor Lloyd's rules prevent the use of fairly large furnaces of the corrugated or ribbed types under high pressure, but the necessity for keeping the diameter of the boiler shell as small as possible to avoid exceptional thick plates and additional weight, &c., necessitates the use of furnaces of small diameter.

All engineers of practical experience fully appreciate the efficiency of large furnaces, and this is readily understood if we consider what takes place when fresh coal is thrown on the fire of a furnace in active condition. The coal at once absorbs heat, which disengages the bituminous hydrocarbon constituents by volatilisation, or, in other words, generates the gaseous portion of the coal by distillation. Until this process is completed the fixed carbon or coke is not consumed. Volatilisation is the most cooling process in nature, due to the quantity of heat which is directly converted from the sensible to the latent state.

It is, in particular, due to this cause that heavy firing is so disastrous, and should be carefully avoided.

As the hydrocarbon gases are volatilised by the first application of heat and pass off, hydrogen having a greater affinity than carbon for oxygen, readily unites with oxygen to the production of water—steam. The carbon thus liberated must be supplied with its necessary proportion of oxygen to the production of carbonic acid, otherwise it will be precipitated in an extremely divided state and pass away as smoke, or, if from various causes the supply of air to the gases should be exceptionally small and badly distributed, carbonic oxide will be produced with serious loss in the amount of heat generated. For carbon consumed to carbonic acid evolves 14,500 units of heat, which, if consumed to carbonic oxide, would yield 4,400 only. Although carbonic oxide may be produced under exceptional conditions, yet, fortunately, it does not appear from the analysis of funnel gases to be generally present, and when present it is usually in inappreciable quantities.

To ensure complete combustion to the generation of heat, it is essential that not only shall the air supply be sufficient, but that it shall be properly distributed in such manner as will readily facilitate completion of the combustion of the hydrocarbon gases as they leave the surface of the fire as well as the fuel on the bars.

This question of air supply is one of considerable difficulty, and has exercised the ingenuity of many capable men. This difficulty is materially increased by reducing the diameter of the furnace, and thus the height above the fire.*

It is of material importance that the necessity for maintaining at high temperatures the hydrocarbon gases as they are evolved should be thoroughly understood. Hydrogen effectively unites with oxygen at not less than 600 degs. Fahr., and carbon with oxygen at not less than 800 degs. Fahr. The higher they exceed these temperatures within certain limits the more readily they unite and the less surplus oxygen required. Volatilisation being the most cooling process in nature, it is imperative the greatest consideration be given to raising the temperature of the hydrocarbon gases as they are evolved, that they may immediately take up and unite with the necessary oxygen to complete combustion and generation of heat.

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* See the writer's paper, "Combustion of Coal and Prevention of Smoke," read before the Institution, November, 1892.

Perhaps in this respect the most serious difficulty to overcome is that great bugbear—heavy firing. Unfortunately, this appears inevitable where the manipulation of the fires is left to the capricious and prejudicial bias of the stokehold. Large quantities of coal thrown on the fire, at once reduces the temperature, and frequently to such a degree that the gases evolved cannot take up the oxygen required, and thus they pass away, forming the huge volumes of smoke so commonly seen immediately after firing.

The smaller the furnace the greater the evil, in that the furnace crown is very much closer to the fire; in fact, without very careful and judicious firing—and where will you find it in the ordinary Mercantile Marine?—the surface of the fire is so close to the crown that immediately the gases are evolved they come in contact with the crown plate, and if we consider that at 250 lbs. pressure the temperature of the water, and hence the plate is, say, 400 degs. Fahr., we at once realise the deleterious effect this must have in keeping the temperature of the evolved gases far below that necessary to complete combustion. Again, the smaller the furnace the less the sectional area above the fire, and thus the velocity of the gases leaving the furnace require to be considerably increased; moreover, this velocity is greatly augmented by the necessity to largely increase the consumption per square foot of grate, due to the small grate area obtainable.

To obtain this necessary high velocity of the gases a lofty funnel with high temperature of the escaping gases must be used or some system of induced draught. High velocity of the escaping gases is, in many respects, a most objectionable feature. Time is an essential element in the completion of combustion, in the union of carbon with oxygen, and in the transmission of heat to the water. At this high velocity the temperature of the gases as they escape from the tubes into the uptake must be abnormally high. True, much of this heat may be utilised in various ways, but it is a costly process.

There is another important feature which does not appear to have attracted sufficient consideration, namely, the gases of complete combustion do not transmit heat by radiation, but by conduction. The sectional area through the tubes being in all cases larger than the outlet from the furnace, facilitates the gases passing from the furnace at high velocity into the tubes in the most direct course without coming in close contact with the large heating surface of the combustion chamber, and probably the suction draught may be so great, when large quantities of coal are burnt per square foot of grate, as to draw the whole of the gases through the lower rows of tubes, leaving the top rows useless.

In Fig. 1 the writer has endeavoured to depict the course gases of high velocity, due to excessive funnel or induced draught, will probably take when passing from the furnaces into the tubes, and from which it will be seen that practically a large percentage of the combustion chamber heating surface is rendered of little or no use, due to the inability of the gases to transmit their heat other than by conduction.

It would appear as though many of the objectionable features referred to are obviated in the water-tube boiler. Of course, there are water-tube boilers and water-tube boilers, as there are in most other things, some to be entirely avoided, others specially designed, and satisfactory for certain purposes only.

For the purpose of this paper, a type of the water-tube boiler known as the Babcock and Willcox is given in Fig. 2. The writer has selected this particular boiler as one that he is somewhat acquainted with, and suitable to the requirements of the ordinary mercantile marine. He specially desires to say that he has not selected this boiler in detriment to other types of water-tube boilers, but principally because he has evidence of its success, as fitted in several steamers, in confirmation of which he gives the following:—Mr. Alexander Gray, consulting engineer, Newcastle-on-Tyne, who has under his supervision four steamers fitted with Babcock and Willcox boilers, informs the writer they are giving the greatest satisfaction, both as to consumption and endurance; in fact, the results are so satisfactory that they are specified to be fitted in two new steamers now building.

The writer having received the following letter from Mr. J. Spear, superintendent engineer to Messrs. Wilson, Sons & Co., Limited, Hull, ventures to give it *in extenso*, believing it will be considered most interesting:—

"Dear Sir,—I believe we were the first in this country to try Messrs. Babcock & Willcox's water-tube boilers in a sea-going steamer, this was over three years ago in our s.s. *Nero*. This boiler is running quite satisfactorily, and the ship has not lost a day for boiler repairs up to the present. A few tubes in the feed-water heater have been renewed, and probably the whole of them will require renewals shortly, as they appear to corrode very rapidly. In the boiler proper only one or two tubes exposed to the fire have been renewed at a trifling cost. About twelve months ago we fitted a new steamer, the *Hero*, with a pair of boilers by the same makers, but somewhat modified in details, no heater was fitted, and the tubes were larger in diameter. We have had considerable trouble with the bottom row of tubes in these boilers, and, in consequence of this, in a third ship, the s.s. *Cameo*, which we have had fitted with Babcock & Willcox boilers, we have reverted to the smaller tubes (slightly larger than the *Nero's*), and up to the present no tubes have given way, neither have any repairs been required to these boilers.

"As regards consumption, there is not much either way, comparing the s.s. *Hero*, *Nero*, and *Cameo* with our most economical forced draught and ordinary boilers, they fall slightly short, but still give as good results as ordinary averages with the ordinary boilers.

"I think the direction in which economy in consumption is to be sought for in the water-tube boilers is in the arrangement of baffles over or amongst the tubes, so as to properly utilise the heat that frequently too easily goes up the funnel.

"We have, as you are probably aware, one steamer fitted with four Belleville boilers. We have not been fortunate in our experience with these, but perhaps this has been from causes other than the design, although it is certain that the Belleville boiler is more difficult to clean and repair than is the Babcock & Willcox, whilst with us the consumption has been greater with the Belleville than with the Babcock & Willcox.

"Yours truly, &c."

In the Babcock & Willcox type of boiler we have a large grate area suitable to the best conditions for complete combustion. The furnace is supplied with two doors sufficiently large to facilitate the distribution of the fuel, and at that convenient height which gives the fireman complete charge over his shovel, a matter of no small importance, particularly with untrained men. By firing at each door intermittently you have always one side of the furnace incandescent when the other is being fired, and thus the hydrocarbon gases evolved are readily heated up to the necessary temperature to their union with oxygen to complete combustion and generation of heat.

The height of the lower row of tubes above the fire offers a great advantage for the supply of air to the surface of the fire.

The writer is not aware whether the following arrangement has been tried, but it would appear to offer some advantages:—Say, for a distance equal to one-third the length of the grate, specially designed slabs of fire-brick be suspended to the underside of the bottom row of tubes, or otherwise fixed. As the fire burns down and becomes a mass of incandescent coke, the fire-brick would store up a considerable amount of radiated heat, which in its turn would be given off in heating up the early gases as they are evolved to complete combustion and production of heat. Such an arrangement would necessitate placing the coal principally at the front of the fire and pushing it back on the grate after the gases were given off.

It will be seen by the drawing (Fig 2), that provision is made to deflect the gases in their passage through the boiler. This is one of the most important features of the water-tube boiler, and due to this not being appreciated in the earlier types, was undoubtedly responsible for much of the loss of efficiency in those boilers, as the gases of combustion passed direct from the fire to the funnel without coming sufficiently in close contact with the heating surface. There is, no doubt, the most efficient position in which to place these deflectors is open to some argument. Whether they should be horizontal or vertical, viz., in a line with, or at right angles to, the tubes is debatable. Horizontal deflectors offer convenient shelves for the accumulation of soot and small ashes, etc.

The writer in his forced draught trials had strong practical evidences of increased efficiency, by keeping the gases passing through the boiler under slight compression. Take the case of the s.s. *Iona*, one of the steamers tested by the committee of the Institute of Mechanical Engineers and under the writer's supervision, and fitted with his system of forced draught. During the whole of the trial the damper in the funnel was only one-sixth open; this gave just sufficient compression to bring the gases into intimate contact with every square inch of heating surface, both in the tubes and in the combustion chambers, to the greatest advantage in the transmission of heat, as shown by the low temperature of the funnel gases. From frequent trials, all other things being the same, the difference in maintaining steam with the damper full open and only open one-sixth was most marked. It will be readily understood this closing of the damper cannot be utilised with natural draught. It is more than probable the application of some such system of slightly compressing the gases in water-tube boilers would do much to improve their efficiency and obviate the necessity for deflectors and baffles, which in itself would be a considerable improvement.

In a paper of this limited description it is impossible to consider the mechanical structure and the many details necessary to an efficient boiler, and which must very largely determine the type of boiler of the future. There is no doubt the present type of boiler, if it does die, will die hard, due to its well-earned popularity, and in all probability it will only be the demand for higher pressures that will kill it.

The writer feels he has left much unsaid, in fact, that he has only touched the fringe of this important subject, yet he hopes sufficient material will be found to promote useful discussion, for, after all, the greatest value of a technical paper is not so much the subject matter it contains as the discussion it promotes and the ventilation of different opinions.

ALLISON'S PATENT FURNACE DOOR.

A VERTICALLY lifting firedoor, unaffected in its movements by the motion of the ship, and whose outward projection when full open is reduced to a minimum, *vide* Figs. 3 and 4 of the accompanying illustrations, and the amount of opening of which can be regulated and maintained as desired, possesses advantages over the old fashioned "fly open" and "slam to" arrangement which cannot fail to commend it to the favourable notice of all interested in stoking.

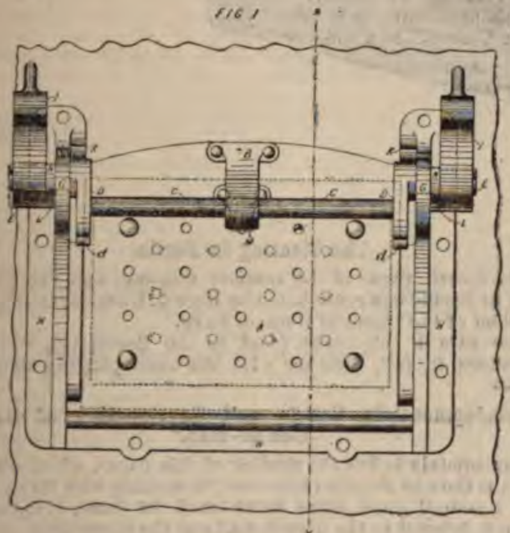


Fig. 1.

A door combining these advantages is now being manufactured by Messrs. A. E. Allison & Co., of 26, John Candlish Road, Sunderland, and is illustrated by the accompanying diagrams, of which Fig. 1 is a front elevation showing the door closed, and Figs. 2 and 3 sectional elevations, taken on the line x, y, and showing, respectively, the door closed and the door full open, the dotted lines in the latter figure indicating the amount of vertical lift imparted by the first motion and by which the door clears the baffle-plate; while Fig. 4 is taken from a photograph, and shows a view of the door as fitted and full open.

Briefly described, it will be seen that the invention consists in rivetting upon the face of the fire-door, provided with the usual baffle-plate, a cast steel radial projection B, having a slot *b* through which passes the cast steel cranked cross shaft C. Motion is imparted to the cross shaft by means of the levers DD, the shafts EE, of which are carried in the side bearings GG. The shafts EE carry the counterweights II, and these lie normally at about the angle shown in Fig. 2, thus balancing the door in any position, and nullifying the effect of the ship's motion thereon.

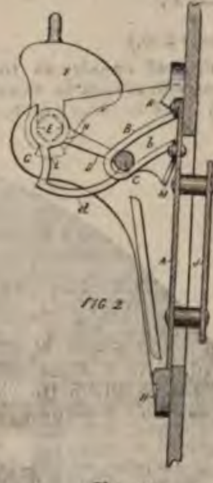


Fig. 2.

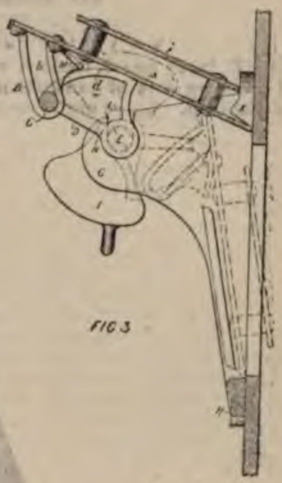


Fig. 3.

To open the door the balance weights are drawn outwards by the handles, causing the cross shaft to act upon the upper internal surface of the slot *b*, thus first causing the door to lift into the position shown by the dotted lines in Fig. 3, and so clearing the baffle-plate J of the edge of the fire-hole. On further depressing the weights the door continues, but only for a short period, to rise vertically, and then moves in an elliptical and outward direction, clear of the fire-hole, until free access is given to the grate as shown in Figs. 3 and 4.

A lug L on each counterweight works against the outer edge of a boss N of the bearing G, and prevents the shafts E lifting in the bearings except when the door is fully open, in which position only can it be unshipped.

It is claimed for this door that it occupies 30 to 50 per cent. less space than any side hinge or swing balance door, figures which appear to be warranted from the fact that when fully open it is directly under the bottom of the smoke-box, thus offering practically no obstruction.

The motions of opening and shutting the door are easily and quickly performed, and it will remain shut, full open, or open in any position between three and seven inches, without the aid of any pawl or catch.

When using firing tools, as in slicing, raking, or cleaning fires, the door can be closed down to rest lightly on the tool handle, so only leaving an opening equal in depth to the thickness of the handle, and thus not only greatly minimising the inrush of cold air, with its consequent loss of steam and injury to the boilers, but, by forming an effectual shield, enabling the stokers to do their work more efficiently.

These doors have now been in use on the vessels of two lines for over twelve months, and the inventor has received, in each case, favourable testimonials as to their durability, economy, and the facility with which they are handled in all weathers.

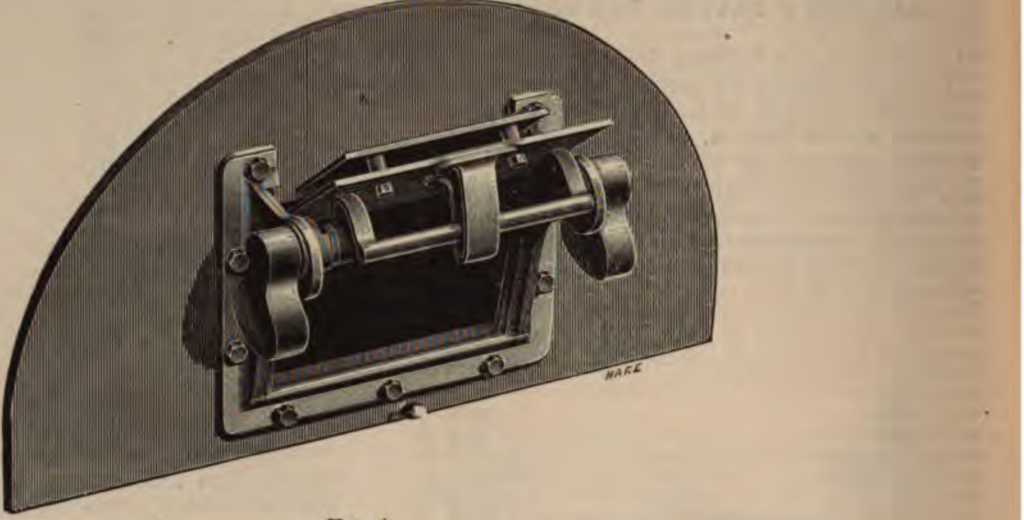


Fig. 4.

THE SUMMER MEETING OF THE INSTITUTION OF NAVAL ARCHITECTS IN GERMANY.

(*Continued from page* 210.)

SOME years ago I made a very critical enquiry as to the relative cost of production of torpedo vessels in Germany and England. There are some of the most eminent builders of torpedo vessels in Germany and England. The result of that inquiry was this, that from 70 to 75 per cent. of the total cost of these vessels was labour, and in that cost of labour the German builders had an advantage of 25 to 30 per cent. over other builders. That was the result of careful inquiry, in which I was helped by the German builders most cordially. That applied to a class of vessel where labour meant a large proportion. Of course if labour is cheaper, then that cheaper labour has a direct bearing on the cost of the production of the material. As to the sources of supply, we know that in Germany, as well as in other countries, there has been in recent years an enormous development in the means of producing ships and engines. I can only say this, that looking to the necessities of the trade of the world, and taking what we know about the capacity of all the countries in the world, it does look as if the sources of supply are going beyond any possible advance. I know that when we were building ships under the new Defence Act in England, when there were Government contracts to an enormous amount being executed, and when there were about one million and a quarter tons of ships built annually in Great Britain, to my certain knowledge there were some of the principal shipyards in Great Britain which had little or nothing to do, which is a very significant fact, and one which, if I had money to invest, would make me pause before putting it into shipbuilding. It is only natural and right that each country should seek to stand upon its own feet, and we as English engineers do certainly congratulate our German colleagues on the way their work is being done, and the remarkable advances which are being made, and if our German friends have learnt lessons in England, we in our turn, I am sure, may learn much from our German colleagues.

Mr. Archibald Denny, having corroborated what Sir William White had said, briefly thanked the author for what he (the speaker) esteemed a most valuable and interesting paper. Herr Laeisz was accorded a hearty vote of thanks for his paper.

Docks and Docking Appliances.

A paper, which included a number of diagrams, on "Recent Improvements in Docks and Docking Appliances," was contributed by Mr. Lyonel Clark, but in consequence of the hour for adjournment having nearly arrived, the paper was taken as read and consequently there was no discussion.

The Secretary next read out a long list of names of new members and associates, making in all 140 added to the roll this year, this being the largest number yet recorded in any year.

Sir William White then proposed, in very graceful terms, a hearty vote of thanks to the members of the Hamburg Reception Committee for the very handsome provision that had been made for the information and enjoyment of the members during their visit to Hamburg. The President having called upon the members to signify their assent, the motion was carried by acclamation, and Herr Laeisz having, on behalf of the Committee, acknowledged the vote, the business part of the summer meeting to be held in Hamburg was brought to a conclusion.

The Meeting in Berlin.

The fourth paper of the summer meeting, and the first one read in Berlin, was contributed by Herr A. Dietrich, Constructor-in-Chief of the Imperial German Navy.

The title of this paper (read by the Secretary), which we reproduce in full, together with the accompanying diagrams, was—

"Development in Design and Construction of German Men-of-War."

Immediately before the reading of this paper, which we publish, the German Emperor honoured the meeting with his presence, and remained some three hours until its close, evincing the keenest interest in the papers read and the discussions.

Sir E. J. Reed having with graceful tact referred to his Majesty's presence as a happy augury of future relations between the two nations, complimented the author upon the completeness of the paper, and thanked him for the labour and time that must have been absorbed in the production of so valuable a contribution on the subject.

Sir William White said: "May it please your Majesty, my lord, ladies and gentlemen,—On behalf of the Institution I would first of all express our most grateful thanks to your Majesty and to the German Government for allowing my old and valued friend, Herr Dietrich, to place before the Institution, and to put upon its records, this most valuable paper. It is valuable not merely as a history of the development of a modern navy in a country where work is always well studied before it is commenced, and where the power of organisation and administration is probably at its highest level, but beyond that it is of value to us who are dealing with these debatable questions to have placed before us the conclusions which have been reached in Germany. It is important that we should always bear in mind that the special requirements of each Navy must be dealt with in settling its designs. It is my fate to continually find myself exhibited in certain newspapers as something worse tha incompetent. Of course one accepts that criticism in accepting the position, but if sometimes those adverse critics would take the trouble to consider the fact that each design for the British Navy is the result of the most careful debate and discussion by the most eminent naval officers in that service, and those naval officers come to the conclusion that altogether for the requirements of the special class which they are then considering it is desirable to associate certain qualities in a design, we should probably hear less in the way of adverse criticism. The Institution and the public knows well that this matter of the settlement of the conditions of designs is not a matter for the naval architect to deal with exclusively.

The naval architects in this matter are the men who have to put in a finished form the requirements of the naval officers. Again I come back to the point that one of the greatest interests we have in this paper is that it gives to the Institution, and to all concerned in warship building, a perfect knowledge of the conclusions that have been reached by the highest authorities in Germany, in view of all the facts, as to the best course to be taken to fulfil German requirements. It is of immense value to get the opinions of competent authorities from all parts of the world, and to profit by the study of the writings on naval subjects produced in other countries, and the designs of warships which our colleagues in all the countries of the world may put forward. We shall all read and study this paper with the greatest interest and with much advantage, and although we may not agree with the conclusions which have been reached, we shall most certainly respect them. There are matters—triple screws, water-tight sub-divisions, the protection of the armament, the arrangement of the boilers and their types, the type of engine to be used—all these are matters on which the author not merely raises the issue but gives us the German solution. In many of these matters he mentions arrangements which have been considered in England and not adopted. For example, the matter of freeboard. In connection with the ships of the *Royal Sovereign* class, one of the things considered was placing the after guns at a lower level. These guns were put nearly as high (within two or three feet) as the forward guns. We have not departed from that arrangement. We think it better to accept the increased weight of armour, and the other penalties in order to get the higher position of the after guns. In connection with boilers it is 16 years since we drew an arrangement for a battleship of high speed, having a combination of locomotive boilers and ordinary cylindrical boilers. The Italians have actually carried that into effect in connection with the design of powerful battleships. We considered exactly the problem considered here in Germany lately, whether we should have the association of cylindrical boilers with water-tube boilers, and if so to what extent. The various plans were thrown down, and the decision was to accept water-tube boilers throughout. In reference to the remark that we appear to prefer the Belleville boiler, why we prefer it is simply this: That it is the type with which the largest sea experience has been gained. But we have been trying other boilers concurrently where experiments may be properly made. In regard to the engine—whether it is desirable to go in for economy of coal; to adopt that type which gives the greatest economy of coal, or to adopt that of a simple character, which allows you to dispense with the use of fresh water and large distilling plant. If you could dispense with these, no doubt that would be an advantage, and it is a case of the balance of advantage and disadvantage. We have ships already in which the condition spoken of as a possible alternative is fulfilled. We have made careful experiment, and come to the conclusion that it would be better to keep on with the economical type of machine. I do not desire to drift into detail, but perhaps the meeting would be interested to know that this same problem which we have one solution of here has been considered in England, and another solution reached. I have had the honour of visiting some German shipyards, and it gives me the greatest pleasure to testify to the remarkable skill and capacity of German designers and shipbuilders. It is only a short time ago that I had the opportunity of visiting the *Wehr Wolf*, at Cowes, when she came as escort to your Majesty. I went on board on her arrival and saw her in her work-a-day dress, and I can only say that I was greatly impressed with what had been done in the small dimensions of that ship, and as a valuable class in the German Navy I can well understand its development. Only two days ago at Hamburg we had the opportunity of getting a remarkable object lesson on what is possible now in Germany in the way of ship production. We saw in Hamburg one of the finest and best equipped establishments for the building of ships and engines in the world. We saw there specimens of steel castings which it would be difficult to match elsewhere, and I daresay it is within the knowledge of Herr Dietrich, although he does not allude to the fact, that English shipbuilders and engineers are not too proud to come to Germany for the very excellent castings and other things which they can here obtain. One thing is inevitable, speaking as one who has been a private shipbuilder, one cannot help regretting that the time has passed when Germany looked to England not merely for the knowledge of what was being done in England, but for assistance in the actual production of ships and machinery. But it was inevitable that a great commercial and mercantile place like Germany should not be content to remain longer in that position, while as an ex-private shipbuilder I hope that it may yet be possible to construct in England something for the German Navy, but if I was a private shipbuilder I should scarcely venture to entertain that hope.

The President conveyed the thanks of those present to the author for his highly interesting and valuable paper, and Herr Dietrich having suitably replied, Dr. Francis Elgar then read a lengthy paper on "The Classification and Relative Power of Warships."

Both the paper and the discussion it gave rise to, and in which Admiral Fitzgerald, Sir E. J. Reed, and Sir Wm. White took part, were of a very technical character and could not well be summarised, while the subject is not of sufficient general interest to our readers to warrant us in reproducing the paper in full. Admiral Fitzgerald ended his exceedingly clever and witty speech by saying that Englishmen looked with very cordial goodwill on any increase in the German Navy. Wherever English ships of war went they always felt they met friends when they encountered a German vessel; and for himself, when he heard of a new German ship being constructed he always said, "That's one more on our side. I don't know if I am right or wrong; I may be wrong, but that's my view." Meanwhile the Emperor laughed very heartily, and bowed towards the gallant Admiral.

The passing of a vote of thanks to Professor Elgar concluded the business of the day, the Emperor, who had remained during the whole three hours over which the meeting extended, being loudly cheered on his departure.

The first paper read on the concluding day of the meeting, Saturday, June 13th, was one which had been held over from the previous Thursday. This was contributed by Herr Otto Schlick, and read by the Secretary, the title being,

"On Signs of Weakness in Tank Steamers."

The author commenced by stating that it is well known that signs of weakness in steamers usually appear near the midship section, and it is generally here that loose rivets in the butts of sheerstrake and upper-deck stringer-plates, or cracked plates appear, and this agrees with the theory of strength. It, therefore, naturally surprises us if analogous symptoms manifest themselves in the ends of ships in such strakes of the outside plating as are about in half the vessel's depth. This is, however, frequently noticed in tank steamers. Experience shows that in many tank steamers the rivetting of butts and longitudinal seams situated about half way of the depth of the hull and near the after end gets loose, and that in certain places the outside plating is torn through. This occurs with such regularity that it is possible to fix the exact spot where, in the course of years, the outside plating of certain tank steamers will tear. The crack generally becomes first observable in a rivet hole, and soon extends over the whole width of the plate. It occurs always exactly in the place where the frames change their convex shape into the concave; in other words, where they form a nearly straight line, and have their greatest rigidity. The fact that the cracking of the plates occurs at a great distance from the midship section, and that this is regularly the case in that strake of outside plating situated at about the half depth, plainly shows that we have not to deal with the tensile strain produced by longitudinal bending. One must come to the conclusion that it is simply a question of the shearing forces which occur in the longitudinal seams of the plating. It is notorious that in a loaded girder supported at both ends the shearing forces have their greatest effect at the extremities and in the neutral axis; nearly the same applies to a ship's hull with only this difference, that the maximum shearing forces are not at the extreme ends, but take effect at a larger or smaller distance from the ends, according to the distribution of weight in the longitudinal direction, and to the fineness of the lines; but the maximum shearing strain always exists at the level of the neutral axis. In wooden vessels it is the wrinkling of sheathing that shows the effects of the shearing forces; in iron ships the symptoms of weakness produced by the same cause are nearly unknown, except in the cases mentioned above. In the cases which have come under my observation the strakes of the outside plating were of exceptional width (over 5 ft.), and it is to be assumed that this has something to do with the cracking of the plates; for the shearing forces occurring in the longitudinal seams gradually increase with the width of the plates. Very likely the strong vibration in tank steamers helps the cracking of the plates. The fact that similar symptoms have not hitherto been noticed in the fore part of ships is explained, partly by the smaller strain which occurs in the fore part; and, on the other hand, by the greater thickness of the bow-plates, which latter in these cases are mostly thicker than usual, to form a strong bow against ice. The symptoms named in every way confirm theory, and we conclude therefrom that it is not always permissible to leave the effect of the shearing forces entirely out of consideration, as has been generally done. Indeed, in view of the continuous increase in dimensions, we must not, in future, neglect to give our attention to this point. The conclusions to be drawn with regard to the construction of ships exposed to heavy strains are the following:—In the first instance, it will be useful to have the treble riveting of the butts, which are situated in half the vessel's depth, extended more towards the ends of the ship. Formerly double riveting was considered of sufficient strength. The extension of treble-riveted butts towards the ends is required where exceptionally wide plates are used. The classification societies generally prescribe a stronger riveting of the butts whenever the breadth of the plates surpasses a certain limit. It is evident that in doing so the prevalent intention was to avoid the diminution of the strength at the middle of the ship arising from the use of broader plates. Whenever saving weight is important in the design, only single riveting for the longitudinal seams and double riveting of the butts of those strakes situated at the half depth should be permitted, but only for a certain distance in the middle of her length. But at the ends the riveting of the longitudinal seams should always be double, and treble in the butts. We further learn from these observations that it does not appear practicable to reduce the thickness of the strakes which are at half the height of the ship towards the ends. Doubling the outside plating as a means for obtaining greater strength in the direction of the longitudinal axis seems admissible only (for the reasons already given) in the upper and lower plating, because the shearing strain between two adjoining strakes of plating is here inconsiderable. At the ship's ends double outside plating should, as far as possible, be avoided, unless it is considered right to go so far as to apply butt-straps to the longitudinal seams.

Mr. Swan, in opening the discussion, referred to the difficulties that were experienced in the construction of the early tank steamers, and said that although some weakness had been manifested in points of detail, the design of the tank steamer of to-day remained very much what it was at the beginning. Some trouble arose in consequence of the action of certain captains when running in ballast, which resulted in large bodies of water washing about in the tanks of the ship, causing great strain on the bulkheads; but increased strength had been provided to meet these strains, and no signs of weakness were now observable. He added that at the present time the very best tank steamers could be built in Germany as well as anywhere else.

Mr. J. Gravell remarked that Herr Schlick's paper dealt only with signs of straining in the shells of tank steamers, and he was ready to believe that weakness had been manifested at the point referred to. He must say that in his experience only one case had come under notice of a break in the shell plates aft, but that was in the line of rivets connecting the after peak tank top. It was just possible that in the vessels alluded to in the paper there had been some special weakness in the local stiffening, or the fracture might have been attributable to vibration rather than shearing force. Perhaps it would not be out of place if he referred to failures which were more frequent than those which the author had brought under their notice. It was known to everyone who had to do with oil steamers that the greatest trouble was caused at the bulkhead connections at web frames. In his opinion these defects, in the majority of cases, were due initially to loose rivets, and this looseness was largely caused by carrying oil and water ballast alternately, a point he desired to emphasise. What took place he believed was this:—When the rivet was closed up it was enveloped by a very thin scale, which became saturated with oil if the head or point be not absolutely oil-tight. The vessel then took water ballast, which had a corrosive effect on this scale, and the corrosion or rust thus produced was prevented from hardening up by the next cargo of oil, so that when this process had been going on for some time the rivet was slowly reduced in diameter, and slackened. If this happened in rivets connecting important members, they would be unable to bear the stress thrown upon them, which must be taken up by neighbouring parts, so that no matter how large connections might be, if the corrosive action described could not be prevented, then trouble must be anticipated. This applied equally where angles or plates were connected with the mill scale between. If Herr Schlick's diagnosis be correct, then his paper was a practical confirmation of the theory thoroughly elucidated by the late Professor Jenkins, in a paper read before this Institution in 1890.

Mr. Martell had very few words to say on this paper, but in the first place he should like to express their very great thanks to Herr Schlick for the kind attention that he gave them, in particular on their voyage in the *Furst Bismarck.* With regard to the paper, he was bound to say that as far as his experience went, the result given in the paper was rather surprising, because, although they had built 70 of these vessels, he could not remember one instance where symptoms of weakness occurred in the part referred to. It seemed to him almost impossible to conceive that this rupture, if it took place, could be due to longitudinal weakness, or that there could be any shearing of rivets from that cause. If these symptoms were observed he should rather think, owing to the maintenance of transverse strength, that it was due to the panting of the vessel at this part, and that might be more readily conceived when they considered that in oil-carrying vessels the engines were generally placed aft. The consequence was that there was rather a difficulty in keeping up the continuity of transverse strength by fitting beams at this part, and unless the absence of these beams was compensated for by proper web frames to keep up the transverse strength, there would be a panting motion going on at this part, which eventually would cause symptoms such as described. It would have added much to the usefulness of this paper had the author indicated what kind of vessels these were, because if they were built to the requirements of Lloyd's Register, he should like to look into the matter to ascertain how it was that the surveyors who had these vessels under survey never reported such symptoms as these; or, if they said that it was so, to endeavour to do something to obviate such results. He considered it be a subject of importance, but Herr Schlick rather attached small importance to it. The speaker thought that if they could foretell certain rupture in the shell of a vessel, and certain symptoms of weakness that could almost be calculated upon, seeing that it could be remedied, it was the duty of those who had anything to do with the construction of such vessels to see that it was remedied without delay. He had to express his thanks to Herr Schlick for bringing this subject before them.

Sir William White having briefly complimented the author of the paper,

The President expressed the hearty thanks of the meeting to Herr Schlick for his paper.

Watertight Doors.

Mr. B. Martell next read a paper, which was illustrated by a very large number of diagrams, "On Various Descriptions of Doors Applicable to Watertight Bulkheads, and their Fastenings, &c." The author, in the course of the paper, said:—The safety of steam vessels depends so much upon the efficiency of watertight bulkheads as regards their number, strength, and the mode of fitting and fastening doors to the openings in them, that it is not surprising the subject has occupied the attention for years of naval architects, engineers, and naval men. During the recent spring meetings of the Institution, two interesting papers on this subject were read by Lord Charles Beresford and Signor Soliani, particularly bearing on the openings found in watertight bulkheads of steamers, and the mode of fastening them. The question of the efficiency of watertight bulkheads considered alone as to their strength may be regarded as settled. In 1890 a committee was appointed by the Board of Trade to investigate and report on this subject, and an elaborate and valuable report was presented to the Board of Trade, and published. In 1892 I had the honour of reading a paper on the same subject before this Institution, and gave the names of 33 steamers having watertight bulkheads, built in accordance with the requirements of Lloyd's, and which had been found sufficiently strong to prevent rupture when a compartment had been filled. Since that time extensive experience has been gained of the efficiency of watertight bulkheads by filling a number of compartments throughout the length of more than 130 steamers, and it may now be safely stated that bulkheads built to the requirements of Lloyd's are sufficiently strong to withstand any water pressure which may be brought against them. Under these circumstances this paper is confined to drawing attention to the plans adopted and proposed for protecting openings made in bulkheads where necessary for the working of the vessel. That communication between compartments in steamers is of the greatest convenience in working is unquestionable. At the same time the safety of vessels is much increased by maintaining as many bulkheads as possible intact; and in cases where it is considered necessary to perforate them, by fitting doors which can be closed and fastened with facility. It must be admitted that too little attention has been given to this point, and although many excellent designs have been brought before the public for a long time, old-fashioned plans are generally adopted both in war and mercantile vessels. In the latter case, it is not a matter of so much surprise, as, competition being so keen, extra cost in adopting new plans is generally fatal to inventions. This, however, does not prevail as regards the Government, and it is thought much good would be done in extending the adoption of the most approved plans in the Mercantile Marine, if the Government were to mark their appreciation of them by selecting some of the best. It may not be out of place to give the following extract from the report of the committee appointed by the Board of Trade in 1890, already referred to, regarding openings in watertight bulkheads:—

"We recommend that any passage-ways through such bulkheads should be subject to the following conditions, viz.:—(*a*) That all openings in watertight bulkheads be fitted with efficient watertight doors. That portable plates be inadmissible, except in the engine-room space, and that an entry be made in the ship's logbook whenever such a plate is removed, and also when it has been efficiently replaced, and that such entry be afterwards copied in the official logbook. (*b*) That all doors forming part of watertight bulkheads—except such as are already shut—be closed before the vessel puts to sea, and be closed subsequently at least once in every 24 hours while on the voyage, and the fact entered in the official logbook. In addition, we recommend that watertight door drill be a preliminary to the usual fire and boat drill. (*c*) That a watertight door may be self-acting or otherwise, but should be workable from above the bulkhead deck, and have an index showing whether such door is open or closed, except in the case of double doors, the mechanical arrangement of which necessitates one being closed before the other can be opened, and in the case of doors which are only used when the vessel is loading or discharging cargo, or at a port or place of call; such doors should be closed under the supervision of the officer in charge of the vessel before she is cleared for sea, and an entry to that effect made in the ship's logbook at the time, and signed by the said officer, a copy of such entry being afterwards made in the official logbook. (*d*) That openings in watertight bulkheads, through which coal may be worked during the vayage, be fitted with approved double doors as described above, or any equally safe arrangement. In no case should a watertight door be considered as forming part of a watertight bulkhead, when coal, which may be passed through it while the vessel is at sea, is liable to rest against it. The committee also recommend that each water-tight compartment intended for occupation by crew or passengers, should be provided with some independent means of escape, other than by water-tight doors, available under all circumstances."

It must be evident that to carry out such recommendations in ships having, as Lord Charles Beresford said, two hundred and eight doors, would be impracticable, and this leads to the consideration whether danger might not be greatly reduced, in view of the large number of perfect traverse bulkheads fitted to large war vessels, by insisting on these bulkheads being intact, and allowing doors only in partial bulkheads contained within these principal compartments. In the largest modern battleships there are 10 or 12 of such main bulkheads, and a profile sketch is appended illustrating the arrangements of these. This arrangement lends itself to a provision for greater safety than can be adopted in mercantile vessels. Of course those who are responsible for the designs and construction of warships know to what extent these main bulkheads can be preserved intact by the absence of openings of any kind. But that the safety of these vessels would be immensely increased in case of collision, &c., by such an arrangement is obvious to all, and the French are carrying this out to a greater extent than any other country. From the remarks of Mr. Gearing, the late chief engineer of the steamship *Paris*, it would appear that his experience was that openings in bulkheads could be dispensed with without undue inconvenience. At the same time, openings were, it is known, subsequently made in some of the bulkheads, and doors were fitted and worked by hydraulic appliances. As regards mercantile ships, the number of watertight doors fitted to the bulkheads is but small. Perfect bulkheads, without being pierced, are preferable, but Lloyd's sanctions the fitting of doors, provided the arrangements are satisfactory. The surveyors to Lloyd's are not required to insist on any particular description of door being fitted, so long as they are satisfied that the arrangements are efficient. Except in a few special cases, the collision bulkhead is preserved intact, and, although it was formerly the practice to fit a sluice to this bulkhead, inconveniences were found to result from it, and in 1888 a rule was made that no sluice valve is to be fitted to the collision bulkhead.

These rules also provide that no sluice valves or cocks are to be fitted to the engine-room or other watertight bulkheads, unless they are arranged so as to be at all times accessible; and where sluice valves are fitted they are to be so arranged as to be controlled above the load water-line, and the rods boxed in to prevent injury. The watertight door on the engine-room bulkhead for access to tunnel, is required to be fitted so that it can be worked from the upper deck. It is very important that where doors are fitted to bulkheads, the workmanship should be of the best description, so as to ensure the door being completely watertight; also that the door and its frame should be sufficiently strong to withstand the pressure which may be brought upon it, in the event of the compartment on one side being flooded. Although a slight leakage, due to imperfect fitting of the door, or any deformation arising from water pressure may not affect the safety of the vessel, yet, where valuable cargoes are being carried, considerable commercial loss may result. I may, *en passant*, emphasize the fact that the human factor must be taken into consideration in connection with any arrangement of fittings for watertight doors; and, with this in view, I would call attention to the importance of all screw gear for opening or closing these doors being arranged so as to work one way for closing, whether the door is on the starboard or port side of the bulkhead. In connection with the paper read before this Institution in 1892, I gave illustrations of the ordinary hinged, horizontal sliding, and vertical sliding watertight doors, and do not reproduce them now, but place before you a number of sketches and descriptions of various kinds of watertight doors, and arrangements for opening and closing them, which in my opinion, are well worthy the consideration of those interested in the safety of vessels. The main cause of the losses of vessels, which will be remembered by most of those present, has been due to the difficulty of quickly closing the doors in the bulkheads, and this has led to many ingenious inventions to provide quick and effective means for closing doors in any emergency. It is thought that the time has arrived when a useful purpose could be served by placing before members most of the plans which are now in existence, in the hope of a more extensive adoption of some of these plans, which are doubtless great improvements on the ordinary hinged and sliding doors secured with clips, &c., which are in general use. The speaker then described in detail a number of watertight doors of various types, but as we do not purpose illustrating these, a bare description would scarcely be intelligible.

A very animated discussion, in which Lord Charles Beresford and Sir William White took a prominent part, followed the reading of this paper, and although the President requested members to confine their remarks within the limits of the paper, most of the speakers touched upon the broader issue, dealt with, and on which Lord Charles Beresford read a paper at the spring meeting.

Mr. Courtier Dutton thought the paper was very suggestive of *Punch's* advice to people about to marry, for it seemed to say that the most efficient form of watertight doors was to have no doors at all.

Mr. Gearing, having offered some suggestions, Lord Charles Beresford said that he was against having any doors whatever, but if watertight doors were to be provided the paper certainly had the merit of bringing to their notice greatly improved methods of fastening them. So far as the British Navy was concerned, he did not think that it would be possible for either the vertical or horizontal doors to fasten in a more awkward or less effective manner. If they were to have doors at all in the belly of the ship, each door should be capable of being closed effectually by one movement. He agreed with the view expressed by Professor Elgar in his paper on the classification of warships, that "it certainly should be required of a warship that she would be reasonably safe after a single blow from the ram or torpedo." The French navy were doing away with these doors, and so also were the Germans. But in the British Navy openings were still cut in the bulkheads in vital parts of the ship, and when he was told that the openings were provided at the request of the naval officers themselves, he would reply that he thought the senior officers too old; they did not like climbing up one side of a bulkhead and down the other.

Sir William White maintained that Lord Charles Beresford did not represent the views of naval officers on this question. What had been done in British warships in this respect had been done as the result of the experience and suggestions of the service afloat. Lord Charles had said that the normal condition of a watertight door on board ship was that of being open. He would inform his lordship that the normal condition of a watertight door on board one of her Majesty's ships was that the door should be closed; and there was a marked distinction between the two things. The orders of the Admiralty were most precise and emphatic on the point. They owed Mr. Martell a debt of gratitude for the trouble he had taken in bringing before them particulars and illustrations of so many watertight doors, and while he had the greatest respect for Lord Charles as a naval officer, he did not recognise his capacity as a mechanical engineer.

Admiral Fitzgerald believed that there had been a great noise about nothing in this matter, and that Lord Charles had discovered a mare's nest.

Sir Edward Reed contended that they ought to assist Lord Charles Beresford in so guiding and influencing the opinion of naval officers that the number of these doors might be reduced to the lowest possible point. Nothing could be more unfair or unjust than to fix the responsibility for the number of watertight doors on the Naval Constructor, who wanted as few as those engaged in working the ship would be satisfied with. Sir William White had said that the naval officers at large did not agree with Lord Charles Beresford, but that did not weigh with him (Sir Edward) in the least. They had got to overcome this desire for convenience in the naval service, and they should assist Lord Charles Beresford in educating the naval service to a better appreciation of the position.

Mr. Gravell also spoke, and Mr. Martell having briefly replied, the usual vote of thanks to the author of the paper was carried by acclamation.

At this stage of the proceedings a vote of

Thanks to the Reception Committee

was proposed by the President, who said: Gentlemen, I have to propose a very cordial vote of thanks to the Reception Committee in Berlin, and I would ask His Excellency, Admiral Hollmann, and his colleague not to judge the gratitude we feel by the length of time at our disposal in which to express it. I wish to assure him that we shall return to our own country with feelings of the deepest gratitude towards the Reception Committee and the leading citizens of Berlin. I do not believe that any other public body or institution has ever received so much kindness, so much attention, or been more highly honoured than has the Institution of Naval Architects in Germany. I would also ask him to recollect that if by good chance either he or any of his colleagues should find their way to our shores we will do our very best, in some small degree, to repay them for all their kindness. We cannot hope to equal or emulate what they have done for us, but they may rest assured that if they should come they will receive a very hearty welcome from the bottom of our hearts, and that we shall do the best we can to make their stay pleasant and interesting. I would couple with this vote the name of his Excellency, Admiral Hollmann, the Minister of Marine.

The proposition having been enthusiastically adopted,

Admiral Hollmann, who was received with hearty cheering, said: My lord and gentlemen, allow me to express in my own name and in the name of the Reception Committee, consisting of members of the German Government and of representatives of the City of Berlin and the great corporations of commerce and industry, our sincerest thanks for your kind words and for the manner in which this vote has been passed. We wish you a happy return to your English island, and we hope you will retain kind remembrances of what you have seen and heard in Germany.

Electricity on Board Ship.

Mr. Holmes (the Secretary) then read a paper contributed by Herr F. Eickenradt on "The Use of Electricity on Board Ships," in which he said—Except in isolated cases of minor importance, electricity has recently only been brought into more extensive use for working auxiliary machinery on board ship. Not only has the electrician endeavoured in the last few years to interest the shipbuilding industry in the application of electricity, and to draw the equipment of ships into the province of their commercial supplies, but also the shipbuilder, whose work may be described as a rallying point of every new technical invention developed to its utmost extent and completeness, and who is thereby obliged to follow every further step, could not afford to neglect the obligation to make a practical test of the value of the electric motor on board ships. The first question was to ascertain whether electricity had special advantages to offer over steam power. This question may be answered with a decided "yes" in many cases. The large number of auxiliary engines in use on board modern steamers, and still more so on men-of-war, not only as accessories to the main engines, but also for other purposes, necessitated the laying of steam pipes into almost every corner of the ship, both for the purpose of bringing steam to the spot, and for carrying away the exhaust, which does not contribute to the comfort of the crew. This network of pipe produces, notwithstanding most careful covering, not only troublesome and unnecessary heating of spaces, but leads to still greater inconveniences in consequence of the damages to which such steam pipes are unavoidably subjected. The leaking of a single flange may make staying, even in large rooms, impossible. These evils are avoided if the transmission of power is effected by wire, which, when properly adjusted as to dimensions and well insulated, has absolutely no effect upon its surroundings. The second question is whether the electric motor is superior to the steam motor. It must be admitted that a steam engine is disagreeable; it emits heat, and is exposed to many accidents, which may produce detrimental, and even disastrous effects to its vicinity. Such accidents do not arise with the electric motor, besides which it has the advantage of being very simple to manipulate, as long as it is at all efficient for use, and what is especially of importance for the circumstances, it is much cleaner to handle than a steam engine. I make this reservation with the electrical motor, "as long as it is efficient for use." This point appears of importance in regard to its usefulness on board. The electric motor has, however, hitherto remained quite unknown to the engine-room personnel. They are not sufficiently familiar with its arrangements, and they do not know what to do when a breakdown occurs. On the other hand, it must be admitted that the electrician has recognised this fact to a certain extent, and has provided for it, partly by simplifying every apparatus as much as possible, the reliability of the working of which has to be safe-guarded, and partly by excluding those parts which do not require any special attention from any possibility of being touched by incompetent hands. Supposing that a motor has been constructed with the most complete perfection, the only attention it would require would be that at certain intervals it would be necessary to inspect the bed-plates, and to ascertain the condition of the insulation in the wires. With such attention it becomes possible to supervise several motors, which are worked from a common centre, by a very limited number of hands, which undeniably is a great advantage. The paper then dealt at length, and successively, with the following subjects, viz.:—Installation for lighting, ventilation, and heating, ships' winches, ammunition supplies, appliances for moving guns, and steering apparatus; and in concluding the author said: At the close of my remarks I will only touch upon a general question, which is of importance for electrical installations on board. With the increasing employment of electricity, the question arises whether continuous or alternating currents should be chosen. In installations hitherto made the continuous current has been used; it has proved efficient, and there has been no occasion to discard it as long as there was only a question of illuminating the interior end of search-lights. The latter can only be worked with continuous currents, otherwise their lighting power would suffer a decrease of about 40 per cent. As on men-of-war the consumption of energy for the search-light reaches 20,000 to 70,000 Watts, it is evident that, for the kind of current required for lighting the interior, and for several small motors, continuous current can only be utilised. The injurious influences upon the compass may be avoided, with such a current, by careful disposition of the conduits and the scientific construction and fitting up of the dynamos. But when it comes to a general introduction of electro-motors for working the auxiliary machinery, and a central station is erected for this purpose, which, like one already in construction in Germany, works with a power of 300,000 volts, the employment of continuous current offers considerable difficulties. In particular, the motors placed on deck for the gun-turning apparatus and ship's winches have to be placed in such dangerous proximity to the compasses, that the disturbing of the latter, in the case of parallel current, can hardly be prevented. For the working of this machinery the use of the alternating current becomes unavoidable, as such a current, and motors driven by it, has no influence upon the compass. This necessitates the erection of two central stations—viz., one for the search-lights, the lighting, with parallel current; and a second station, with alternating current, for driving auxiliary machinery. Unfortunately this entails the disadvantage that the motors for one station cannot be employed in support of, and in substitution for, those of the other, and great complication would be created demanding greater capabilities from the crew. It will be impossible to avoid this if the increased advantage which the use of electrical appliances affords on board ship are to be secured.

There was no discussion on this paper, and the President having proposed the usual vote of thanks to the author, announced that this concluded the Summer Session so far as the reading of papers was concerned.

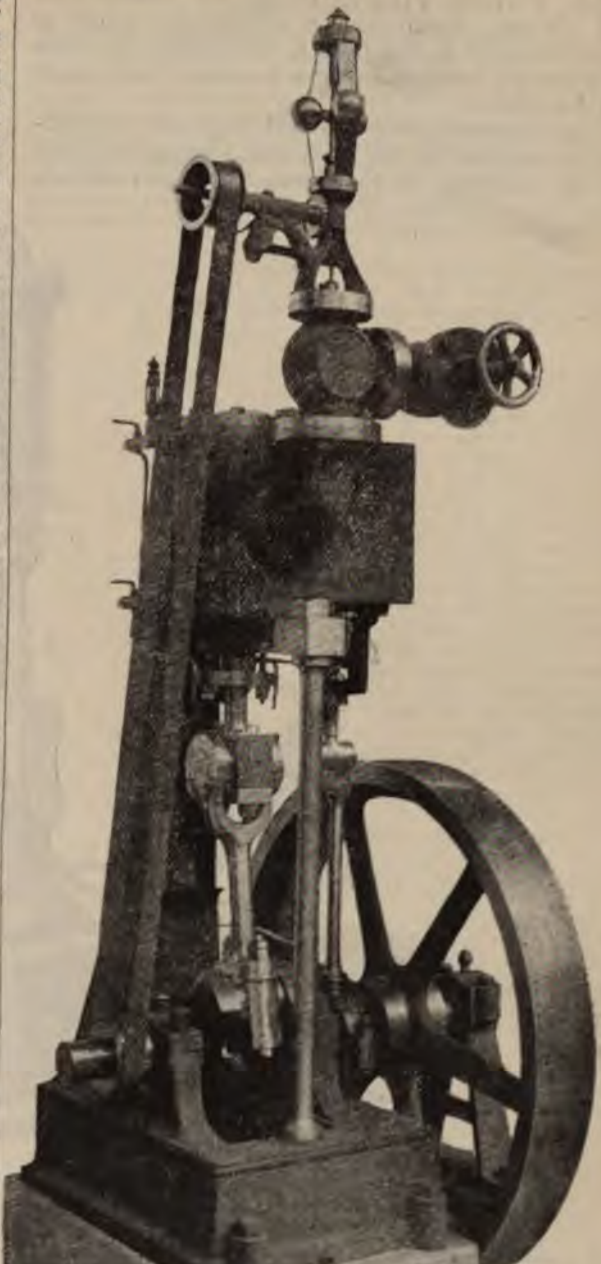
HIGH-SPEED ENGINES.

THE accompanying illustration is prepared from a photograph of a pair of strongly, and at the same time neatly, designed high-speed engines, which we had an opportunity of inspecting during a recent visit to the Cardiff Exhibition.

Manufactured by Messrs. John Shearman & Co., engineers, Bute Docks, Cardiff, these engines are intended for the direct driving of dynamos, centrifugal pumps, fans, or any other purpose where high speed is required, the bearings throughout, of the best gun-metal, being provided with exceptionally large surface for that purpose, while ample provision has been made for the efficient lubrication of all the parts, and the governing, as will be seen, is effected by one of the Pickering type of governors.

The engine illustrated has a cylinder 10 in. diameter with a 10 in. stroke, and is constructed to run with absolute steadiness at 350 revolutions per minute, the crankshaft, connecting, eccentric, valve spindle, and piston rods being all of mild steel.

These engines are self-contained, occupy but little space, are constructed of the best materials and exhibit a degree of finish, both as regards design and workmanship, not often equalled even in this class of machinery, and are in every case giving satisfaction where employed.



Preserving Timber.—Another method has recently been tried. It consists in dissolving in naphtha the heavy oils and waxes left after the distillation of petroleum, and forcing the solution into the seasoned timber in the same manner as in creosoting. The timber is the heated, when the naphtha evaporates, and is recovered in a cooling chamber, whilst the waxes, &c., remain behind in the wood, waterproofing it.

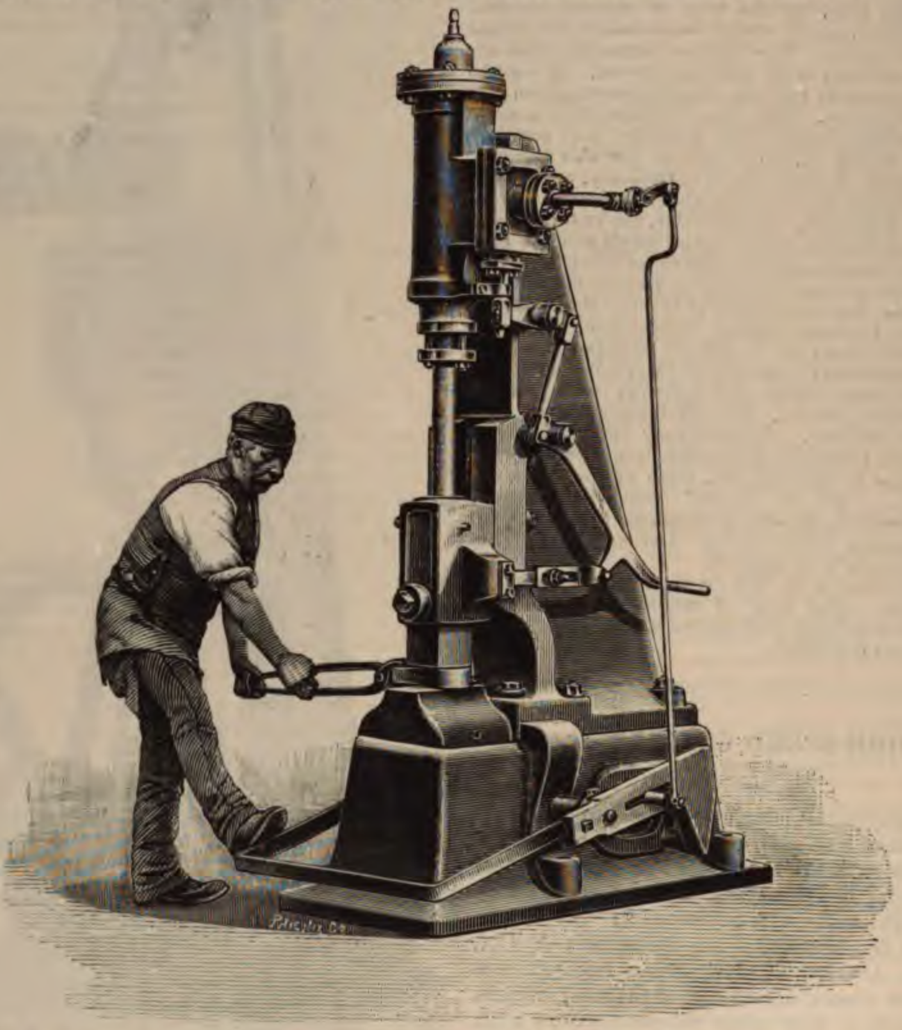
PILKINGTON'S IMPROVED STEAM HAMMERS.

MR. PETER PILKINGTON, of Dowry Iron Works, Accrington, is exhibiting a couple of steam hammers at the Cardiff Exhibition, of which we select the smaller, a 3 cwt. hammer, for illustration herewith.

These hammers possess several novel and interesting features, one of the most useful being that they are, as a reference to the figure will show, entirely self-contained in so far as that the hammer proper and the anvil block are bolted to the same bed-plate, thus enabling them to work on a smaller and less expensive foundation than usual, and also obviating any possibility of the anvil tilting with relation to the blow, and therefore the accuracy of the work done may always be depended on.

With these hammers the self-acting valve motion for maintaining continuity of motion so long as steam is turned on is not dependent upon the action of any cam, or trigger arrangement, but consists, as will be seen, of a positive link motion, which without the aid of springs or any extraneous gearing, is ingeniously designed to give steam to the piston during only a portion of its stroke, thus utilising expansion to its fullest power, provision being made, however, for regulating the steam supply according to the varying demands of the work in hand.

When fitted with the new foot lever device as shown, a smith is enabled to do a very considerable amount and variety of work without assistance as he can regulate the working of the hammer, both as regards the number and intensity of the blows, by his foot, thus leaving both hands at liberty to manipulate the forging upon which he is engaged.



All sizes of these hammers are very strongly designed, well constructed, and carefully finished in every detail, while each is thoroughly tested under steam before leaving the works, and if for export they are immediately after testing and without dismounting put directly into the packing-cases, thus ensuring their being in proper working order upon arrival at their destination, where they may be erected without the aid of any skilled labour.

Mr. Pilkington's exhibit has attracted considerable attention, and we understand that the local agents, Messrs. Joseph Rose & Co., of West Bute Street, Cardiff, have booked several good orders for these hammers, some hundreds of which are now in use.

THE FLEETS OF THE MAIL LINES.

(From our own Correspondent.)

The Accident to the French Tourist Steamer.

In the last issue of these Notes I referred to a report that, in strong contrast to the courtesy of the German Emperor, a British captain had taken the opportunity of finding neighbours in distress to make a hard bargain with them for their lives. I am indeed pleased to find that this report is totally unfounded. Whilst our ears are still ringing with the praise of the Breton peasants, who did so much to mitigate the after-horrors of the loss of the *Drummond Castle*, it would have been indeed unfortunate if any one had made the red ensign cover a piece of sharp practice in regard to our kind and sensitive neighbours. It is pleasant, therefore, to record that the official organ of the French Government—as regards the matters connected with the Mercantile Marine—notices these rumours in a paragraph headed "Confraternité Maritime." Here it is stated that the captain of the British ship informed the captain of the stranded tourist steamer that the question as to the remuneration for salvage services should be left for settlement to the respective owners. This was the most he could do, for he could not be generous at his owner's expense, and the practice he followed is common enough to have been within the knowledge of even those persons who write for the Daily Press. "He besought the passengers to consider themselves at home in his vessel, and was prodigal to them in instances of well-meant hospitality." The paragraph closes by a statement that the shipwrecked passengers of their own motion made a collection to enable them to give a substantial proof of their appreciation of the courtesy and kindness of the officers and crew of the British ship. The whole incident is one which speaks well for all concerned, and it is much to be wished that the real truth might be as widely circulated as the original and erroneous story.

Habitual Regularity of Passage

has come in the minds of many business men, at least, to be of more consideration than excessive speed at irregular intervals. The American Line, for example, in building the *S. Louis* and the *S. Paul*, announced that these steamers were to be of the *New York* and *Paris* type rather than that of the *Campania* and *Lucania*. They believed that passengers would prefer to feel that they could rely in leaving Southampton any Saturday or at a well-known hour and be certain of being landed in New York by the following Saturday noon in ordinary or extraordinary weather alike, than to have an occasional boat which might by chance land them twenty-four hours earlier, if weather and other circumstances were exceptionally favourable. The same idea is apparently actuating the Union Line in its management of the speedy vessels *Scot* and *Norman*. In this regard the performance of the Compagnie Generale Transatlantique's steamer *Labrador* is worthy of remark. She is not a modern boat, and her speed is not, of course, equal to that of her companion on the Central American Line, *La Navarre*, whose performances I have several times noticed.

But the following is a note of the first three homeward trips she has made this year:—

Left Point à Pitre:	Arrive St. Nazaire.
1896 11th January	8 a.m. 23rd January
„ 11th March	8 a.m. 23rd March
„ 11th May	8 a.m. 23rd May

This is indeed clockwork regularity, and that over a twelve days' trip.

The Cunard Fleet.

A correspondent from Swansea asks me for further particulars of the older Cunarders as grouped in my last Notes. He asks for original dimensions, builders' names, an indication of the vessels which were lengthened, and the date of their new machinery. As far as my Notes avail I add what reply I can to his queries. The builders of these vessels may indeed be proud of the genuineness of the material they used and of the honest work put into the ships, whilst the company may boast that it knows the secret of keeping its property in a thoroughly sound condition, or these ships would long ago have been worn out.

The firm who re-engined most of these vessels is a Liverpool one, variously known as Messrs. J. Jack & Company and Messrs. Jack, Rollo & Company, at different stages of its history.

The New Move of the P. & O. Directors

may have a very far-reaching effect. We heard some little time ago that the company had bought some land with a frontage of from four to five thousand feet to the Thames. Now it is said that they are about to construct for themselves docks in this place. The idea is of course pooh-poohed by the, no doubt, terrified directors of the London Dock Companies who say that the P. & O. people are unaware of the cost which such an undertaking as they contemplate would amount to. It is absurd to suppose that men who conduct a line such as the P. & O. with such conspicuous success don't know all about their own business and a good deal about all kindred businesses. They certainly have not paid the enormous sums which have been transferred from their coffers to those of the Dock Companies without learning how heavy are the charges made by the London Dock Companies, nor how much capital is required to bring in such large fees. No wonder the Dock Companies are terrified at losing the best customer they have. I dare say that Southampton, too, is sad if it realises that the contemplated move would attach the company for ever to the Thames and make a return to the Solent impossible. It would seem to me that the affair has gone too far, if the land is actually purchased, for the most tempting concessions on the part of the dock people to be of the least avail to bring back the prodigal. And if the company has its own docks shall we not see it doing much of its own repairing as the West India Royal Mail are wont to do at Southampton? They will surely have a fine engineer's shop to tackle breakdowns and renewals, and one would imagine that it would be necessary to have a large trained staff on shore to meet possible emergencies. That staff would need occupation in slack times and would probably be engaged in building machinery, at all events for the cargo ships. Again, with the prospect of steady employment and the name of P. & O. it might be possible to avoid the labour troubles which have driven work from the London shipbuilding yards and to bring back some of the work which has left the London river. Ten per cent. over cost is what is paid by certain firms to their builders when the relation between customer and builder is close enough for a formal contract to be discarded. That 10 per cent., if saved, might make it worth the P. & O.'s while to enter upon the business of shipbuilding as well as dock owning, and emulate the great French companies. These are only possible results, of course, but they might easily follow and would perhaps lead to others doing likewise.

Vessel.	Year built.	Gross tonnage.	Length.	Builder's name.	Year lengthened.	New length.	New gross tonnage.	New compound engines	Year engined.
British Queen	1849	763	187·1	Denny	—	—	—	J. Jack & Co	1878
Marathon ...	1860	1,784	274·0	R. Napier & Sons	1873	336·4	2,326	J. & G. Thomson	1873
Atlas ...	1860	1,794	276·9	J. & G. Thomson	1873	339·0	2,393	J. & G. Thomson	1873
Kedar ...	1860	1,783	275·8	Denny	—	—	—	J. Jack & Co.	1873
Morocco ...	1861	1,782	275·5	Denny	—	—	—	J. Jack & Co	1874
Tarifa ...	1865	2,058	292 5	J. & G. Thomson	—	—	—	J. Jack & Co.	1879
Aleppo ...	1865	2,057	292·5	J. & G. Thomson	--	—	—	J. Jack & Co.	1880
Palmyra ...	1866	2,076	290·8	Caird & Co.	—	—	—	J. Jack & Co.	1878
Samaria ...	1868	2,574	320 6	J. & G. Thomson	—	—	—	J. Jack & Co.	1878

Note.—The *Aleppo* had triple-expansion engines by James Howden, of Glasgow, fitted in 1890.

Atlantic Weather.

The early part of August brought in reports of very bad weather experienced by west bound steamers about the 28th July. The *Paris* sustained deck damage forward and had some deck cabins washed out, whilst the *Etruria* had her saloon flooded. *La Bourgoyne*, of the Compagnie Generale Transatlantique, arrived at New York on the 2nd August with the officers and crew of the German barque *Ernst*, whom they had rescued—in spite of the loss of their own boats—in mid-Atlantic, when the sailer was in a sinking state.

The North German Lloyd Company

is making rapid strides in the modernisation of its vast fleet, and has a large quantity of twin-screw tonnage coming forward. Meanwhile some of its older vessels are receiving attention. I think I have remarked on the performances of the *Trave* since her great overhaul last winter. She, it will be remembered, was one of three sisters remarkable as the first triple-expansion boats put into the Express New York trade. She has had considerable alterations in hull and machinery, and is now of about 8,600 I.H.P. Her speed is increased so that she has improved about half a day on her voyage, and is now able to cross in something like seven days and a quarter. Inspired by the success of this experiment the owners are about to give her sister the *Saale* a similar overhaul during the coming winter. That will make five vessels in their fleet of modern accommodation and of good speed, and they ought thus to have no difficulty—with the North German reputation for comfort and good accommodation and food—in holding their own with the American line, even if the latter have a somewhat better speed. Captain Willegerod has not felt able to retain his command of the *Spree* long after his commemoration. He has retired to shore life and left a record of numerous voyages completed in safety which will be hard for those who follow him to break. The honour which the German Emperor bestowed upon him in making him a Knight of the Red Eagle is one which, I think, has never been bestowed before on a German merchant seaman. The British equivalent has certainly never been conferred on a certificated officer although our ships are our pride, and we are the first maritime nation in the world.

The Castle Line.

The inquiry into the *Drummond Castle* disaster has ended as one might have expected it would. The officers who are gone are convicted of professional misconduct because they are not before the Court to answer the imputations so freely lavished on them. This is characteristic of the Board of Trade Inquiry, but it is fortunate that other departments of English justice do not follow the same view. Enough mud was thrown at Captain Pierce for some of it to stick in the public estimation, even though the Court admitted in its judgment that "the charges against the captain were practically withdrawn." The lesson so dearly bought has been taken to heart by the managers of the line, and boat drill was indulged in whilst the new *Dunvegan Castle* came round from her builders to the Thames. There the boats were got away in two minutes, —a very creditable performance. But it must be remembered in criticising the *Drummond Castle* incident that there was darkness and rain, that modern ships are the size of little towns, and that much precious time necessarily slipped away before the captain received information as to the state in which his ship was, even if he ever realised the full extent of her injuries. By the way it may be noticed that though the *Tantallon Castle* was fitted with quadruple engines, a return has been made to the triple-expansion type in her later sister. What is the meaning of this?

Some Naval Editors

seem much at sea when they meddle with mail steamers. On the 7th August the writer of "Naval Notes" in the *Globe* gave the best westward days' runs of the celebrated Atlantic greyhounds, and put the *Campania* down at 525 nautical miles. He also quoted a remark from some nautical writer to the effect that the *Campania* required 40 per cent. more power to attain 6·2 per cent. more speed than her next swiftest rivals. He thought there was some fallacy here apparently, but the solution was beyond him. As it is now the fashion to attack the great Cunarders in every possible way, both as to their performances and as to their management, I took the liberty to write him a note, which a week later he patronizingly condescended to make use of as sent by "a correspondent from the Temple." He was indignant at being pulled up for putting the best day's run at 525 instead of 555 miles. He had only "put an eastward day's steaming for a westward one." A steaming time of an hour and a half in the twenty-four is an inconsiderable trifle to a naval writer. Then as to the 40 per cent. more power for only 6·2 per cent. more speed, I pointed out that the comparative bulks of the vessels in question were entirely ignored and that the increased H.P. of the *Campania* was employed to drive *25 per cent. more bulk* at 6·2 per cent. more speed. This self-evident proposition commended itself to his mind, at least till he was better advised. I should not have troubled to mention this matter if it had not appeared that more important writers than he had ignored the greater work required of these fast vessels' engines. Besides it is obvious that when high speeds are reached further increase of speed can only be attained by much increase of H.P.

The New Vessels for the Atlantic Trade

have been doing very well. Slowly but surely the *S. Louis* and *S. Paul* have been shortening their passages. The time of departure, fixed at noon on Saturday from the Empress Dock, has been strictly adhered to. The good passages thus show themselves in the time of arrival at the other end. In June the *S. Paul* was announced as passing Fire Island at noon. Then it was the *S. Louis* at 10 a.m., and now the *S. Paul* has got another hour and a half off the record, reducing the passage to 6 days and 31 minutes, with a mean speed of just over 21 knots, and a best day's steaming of 531 miles. This is splendid travelling and reflects the utmost credit on the Cramp Company, who may justly be proud of the work they have turned out. That work speaks for itself, and it is a great pity that misstatements and exaggerations should be employed by those who have their own ends to serve. These cannot, when nailed to the counter, fail to take off from the satisfaction with which the good work is noted. I will not here go into the attacks made on the British Mail Steamers by the New York correspondent of the *Times*. But we have Mr. Tankerville Chamberlayne, the late member for Southampton, writing to the *Times* and deliberately stating in attempted correction of something they said that the *S. Louis* on a certain occasion landed her passengers at New York at 10 a.m. The owners—who must be very wild with their self-constituted champion—stated that the ship landed her passengers at 2 p.m. That four hours is something of great value in Mr. Chamberlayne's mind may be gathered from the fact that the object of his letter was to claim a gain of forty minutes for a Southampton liner. To the statements of so reckless a person no weight can be attached in future, and the *Times* will be well advised in shutting out his effusions.

The North German vessels which are to vie with the *Lucania* and *Campania* are said to be coming rapidly forward. But it would seem to us that, thanks to the policy of our post office, the building of vessels of the fastest class on British account has ceased. The Cunard Company is, as I stated last month, building a triplet of cargo boats at Belfast, whilst the White Star Company is constructing a sister to the *Gothic* and a couple of repeats of the *Georgic*. There is no sign of any building for the Mail service. This fact is a national danger, for the value of the fastest class of Mail steamer in time of war is undoubted, and we are gradually seeing the resources of our neighbours increased through liberal subsidies whilst our own stand still and are gradually becoming antiquated.

The American Competition.

A good deal of progress has lately been made in the great game of Queenstown and Liverpool *versus* Southampton. The City of Dublin Company is getting well forward with its new boats and is already beginning to speak of the impending sale of many of its fleet. It would seem to be a foregone conclusion that the four present mail boats will be sold. If they are good for any service after their thirty-five years battle with the Irish Sea, they are certainly too speedy and too costly in working for the Liverpool and Dublin branch of the company's service, where already the directors have seen that economic reasons compel them to forsake the paddle. Besides, their very names are being taken from them for the new boats. Then as to the railway journey from London to Holyhead there are already murmurs of dissatisfaction because the contract time is not to be as short as it might be. The railway company says the time is already as short as it is possible. The limit of speed on the railway journey has already been reached.

This, I venture to say, is nonsense. I travelled from Euston to Crewe in two hours and fifty-five minutes by the Scotch express on the evening of Bank Holiday when traffic was beyond all previous records. The Irish mail was not timed to arrive till 11.48 p.m., though it started only twenty minutes later, it was 53 minutes more on the road. Competition makes all things possible. But competition is wanting with the Irish mails. The Great Southern and Western Railway has been doing its best to shorten the journey across Ireland, and at a recent shareholders meeting the chairman expressed his satisfaction with the way the mails had been dealt with and declared his opinion that they had nothing to fear from Southampton. What he did fear was the competition with their old ally, Liverpool. He, of course, meant that there was more fear of the steamers going direct to Liverpool to land their mails than of their forsaking the Lancashire for the Hampshire terminus.

An innovation common to the mails carried by all Atlantic steamers was introduced at New York on the 1st August. The mail bags are now sorted and distinguished by various coloured labels, and the mail tender, in its progress to New York, drops those for the Pennsylvania Railroad and its connections on the New Jersey side. Only those intended for New York and the New York Central Road will be taken on to New York itself, and it is estimated that four hours will be thus saved on the transmission of Philadelphia mails and those bound through that city, whilst for those to St. Louis and the west the saving will be one hour. Of course the lessening of the bulk to be sorted at New York will tend to a saving of some time even in the case of the New York local mails.

An Imaginary Shipwreck.

A Scotch reader writes to ask me for particulars of a wreck which he finds described in the August issue of a well-known American monthly magazine, published simultaneously in the United States and in this country. He asks me for dates and details of the collision between the steamships *Columbia* and *Viking*. On reading the account I find that the casualty described is alleged to have occurred when the *Columbia* was eastward bound from Boston to Europe, and when the other vessel was *en route* from a Norwegian port to the Azores. Internal evidence fixes the date of the alleged disaster at or about the year 1876. I can find no trace of any such collision, and as the whole of the ship's crews and the whole of the passengers by both vessels, save one passenger by the *Columbia*, are said to have been lost, we may be sure that the disaster, if it had occurred, would have been as well known to the general reader as the collision between the *Arctic* and the *Vesta*. The whole tale is merely a peg on which an imaginative writer has tried to hang some ideas connected with a psychological theory of his own. Those ideas are not very brilliant or interesting, and he has tried to excite his readers' interest by an appearance of verisimilitude in his reference to Atlantic liners, and by relating the story as a piece of his own autobiography. Apparently, in the case of my correspondent at least, he has succeeded, but let me say that the writer's knowledge of the history of the North Atlantic trade is not very exact. For he opens his story by mentioning an incident, which, as I said, fixes the date of the collision in 1876. He ends by saying that his wife and daughter escaped by taking passage on the *Gallia*. Now the *Gallia* did not sail on her first voyage till well on into the year 1879. We might almost as well shudder over our narrow escape of being drowned through our want of foresight in not taking passage by the *Ark*, regardless of the fact that we were not born till some years after the deluge subsided. Magazine articles indeed are becoming very amusing now that the general reader has begun to take an interest in the Mercantile Marine, and the general writer has gaily entered on the task of satisfying his requirements. I came across an account in another monthly—a purely British one this time—of a visit to the greatest shipbuiling yard we have. The illustrations were excellent and the letterpress interesting to those who know the value of the remarks made. But that we must not implicitly accept all we are told may be gathered from the following remark, which I noted with some relish. The launching of a great boat six or seven hundred feet long is a pretty sight, but it is an anxious time. Pretty it may be, to see a seven hundred foot boat launched, but no eye has yet seen it. It is needless for me to say to my readers that the *Great Eastern* was not 700 ft. long, and she is excluded from his description by the fact that she was not put into the water in the ordinary way. Only the *Lucania* and *Campania* have yet reached the shorter length which he so glibly indicates as though it were an every-day dimension amongst vessels of the larger class. Nor were these launched from the yard he describes.

Publications.

From Messrs. C. W. Kellock & Co. I have received the copy of their usual monthly catalogue of vessels on sale. Their stock of both new and second-hand steamers and sailing vessels seems as great and varied as ever. The large breakings up of old steamers has not in any way affected the number they have to dispose of. This may be accounted for by the fact that they have not on their books an appreciable quantity of vessels whose day is altogether gone by, though, of course, they are able, through their foreign connections, to dispose of worn-out vessels at exceptionally good prices. The new vessels too seem to come on as fast as ever in spite of the unprecedentedly low state of the freight market.

Messrs. Wilson send me two little volumes of great interest to tourists. One entitled "Holiday Tours in Sweden," and is an excellent little guide to that interesting country. The volume has some very good illustrations, amongst which I notice a good representation of the Cathedral of Upsala, familiarised to many Englishmen by Axel Haig's well-known etching. The other is "Summer Tours in Norway." This too is illustrated and furnished with a map. It gives itinaries of tours suited to the time and money at the disposal of the intending voyager. In connection with the Wilson Line I may mention the rumoured great shipping amalgamation of the lines owned by Messrs. Wilson, Leyland & Furness. As I stated last month, Messrs. Wilson have a fleet of no less than 90 sail themselves. The Leyland Line, though not numerically as important, has some new and very large cargo steamers, three of the latest having a gross tonnage of nearly 9,000 tons each. The Furness Line is largely involved with the Leyland Line financially. It is also now part and parcel of the shipbuilding business of Messrs. E. Withy & Co., and it was recently stated that the Furness Line owned 89,000 tons of shipping. I only give the rumour for what it is worth, but I shall hope in a future issue to go more carefully into the history of the various lines named, so as to show readers how already vast are the lines which are said to be preparing to unite their forces. Amalgamation is the order of the day in matters financial, but it a comparatively new departure for steamship lines.

SHERVAL'S PATENT ANTI-INCRUSTATION FLUID.

We have recently received particulars of an anti-incrustation fluid which is now being put on the market by Messrs. W. S. Sherval & Co., of 20, Cheapside, London, E.C., and which, as its title implies, is designed to prevent and remove incrustation and corrosion in steam boilers.

Though very powerful, and consequently economical, one pint for every 16,000 pints of water converted into steam being all that is required per week, this fluid will not set up any chemical reaction in the metal itself, and thus its use does not entail any wasting away of the boiler plates or the steam pipes, its only action being, whatever the nature of the water used may be, to hold in suspension, and so prevent any solid deposit of the calcareous magnesia and other salts, more or less present in all kinds of waters, which are eventually blown off in the form of mud, thus doing away with the necessity of chipping off the hard incrustation otherwise formed.

The makers state that no matter how thick the deposit of scale in a boiler may have become, the continual use of the fluid for a few months will so soften it as to eventually convert the hard scale into slime, which can be removed by blowing off in the ordinary way.

We need scarcely point out that a clean boiler means economy of fuel, nor need we call attention to the injury done to a boiler by chipping off the scale.

Messrs. Mosses & Mitchell inform us, that from the 1st August they have admitted as partners in the firm, Mr. C. Barry Hayes and Mr. John Wood, who for many years have taken a leading part in its management.

McDOUGALL'S PATENT HIGH-PRESSURE STEAM TRAP.

THE danger due to the impact or "water-hammer" action of condensed water need not here be dilated upon, suffice it to say that such danger has greatly increased with the high steam pressure now carried, and it is with regard to this fact that we have pleasure in herewith illustrating what appears to be a reliable steam trap, specially adapted for use with high-pressure engines.

Broadly speaking, steam traps may be divided into two classes, one in which the valve is operated by the expansion and contraction of metals due to variation of temperature, and the other depending for its action upon a hollow float; and it may equally broadly be said that the most serious objection to the expansion class of trap is that it operates too slowly, while on the other hand the hollow floats are only suitable for low-pressure working.

In the trap herewith illustrated it will be seen from the sectional elevation, Fig. 2, that the action of the valve is dependent upon the movement of a solid tile float, encased in sheet copper, thus enabling the trap to work with certainty at any pressure up to 300 lbs. or more. A reference to Fig. 1 will show that the shell, cylindrical in form, is also specially adapted to withstand high pressures.

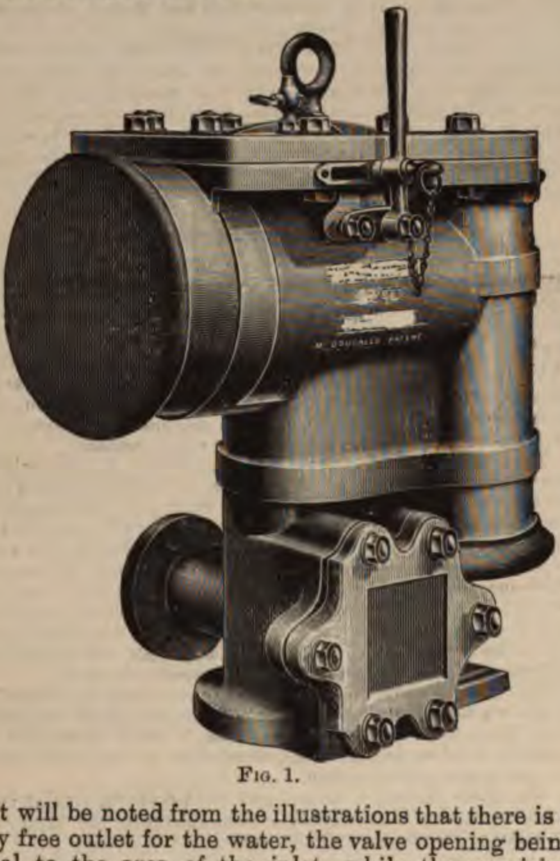


Fig. 1.

It will be noted from the illustrations that there is a very free outlet for the water, the valve opening being equal to the area of the inlet, while the provision of the well below the valve prevents any dirt coming in contact with it or the seating, both of which can be readily examined by the door provided for that purpose (shown in Fig. 1), and which allows of the valve being got at without having to break the top joint cover, or in any way disconnect the piping.

The construction of these traps is as follows:—The solid tile float, carried at one end of the lever L, being a little heavier than water, is counterbalanced by an iron weight at the other end of the lever, the position of the weight being adjusted so that the float begins to rise at the desired point. The fulcrum K works on a knife-edge in a large opening, so reducing friction to a minimum and avoiding any liability to sticking. At a point near the fulcrum K, a link C connects the lever L with the equilibrium valve V, and so transmits the motion of the float to it.

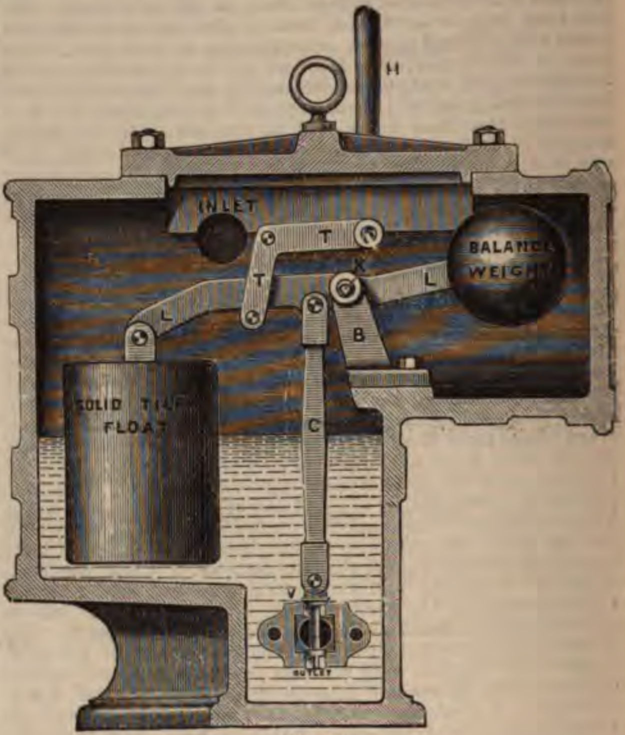


Fig. 2.

A testing arrangement for blowing through whilst at work, and which also allows of any grit that may have settled on the valve seatings being blown away when steam is first turned on, is a special and useful feature of these traps. This addition consists of a test lever H, connected by the spindle S to the studded lever T, by which the lever L, and with it the valve V, is lifted or depressed as required, a few movements of the handle sufficing to clear the valve and its seating of any sticky or gritty substance that may have adhered to them. A chained stop pin (*vide* Fig. 1) ensures the test-handle and lever being locked in the proper position when the trap is working, and the usual means is provided for expelling the air.

These traps are strongly made, all the working parts being of special gunmetal to ensure durability and efficiency, and their use should prevent the recurrence of those terrible accidents, frequently ending fatally, caused by the accumulation of water.

Messrs. Emerson, Walker & Thompson Bros., Limited, of Gateshead, and 11, Leadenhall Street

E.C., who are sole marine agents for these traps, have favoured us with copies of testimonials, from which we see that they are at work (in some cases from the early part of 1894) in many steamers, and have in every instance given satisfaction.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(*From our own Correspondents at home and abroad.*)

The Close of the Manœuvres.

THE mimic warfare of the manœuvres, which began at midnight on Friday, July 24th, came to an end at 8 a.m. on Thursday, July 30th. The scheme of the operations was not wholly revealed until some hours after the war had been in progress, the notion being to keep certain information secret for a time, and thereby to heighten the resemblance to actual hostilities. Unfortunately, the various sets of instructions, rules, and regulations appeared to clash, and their ambiguity lessened in some measure the value of what was done. The "general idea" was in effect a reproduction of what might occur in the event of a war between this country and France and Russia combined. The area of the operations included all the coasts of Ireland, and all the west and south coasts of the United Kingdom between the Mull of Cantyre and St. Alban's Head, with for boundaries the 49th and 56th parallels of N. Latitude, and the 2nd and 15th meridians of W. Longitude. By taking a map and turning it round so that Ireland lies to England as England to France, a clearer idea of the scheme will be obtained. The Irish Sea represents the Channel, and the North Channel between Ireland and Scotland the Straits of Dover; the Land's End is Ushant, and to go to Ireland is to pass round the North Cape and into the North Sea. Furthermore, Milford and Torbay represent Cherbourg and Brest, while Kingstown is Portland, and Berehaven remains Berehaven. In these four ports, at the time when hostilities were supposed to be imminent, four fleets were placed. At Milford was a fleet, "C," commanded by Vice-Admiral Seymour, quite ready for sea, and at Torbay another, "D," commanded by Rear-Admiral Wilson, which by the rules was considered to be in process of mobilization, and not ready to put to sea until 48 hours after war had begun. Opposed to these forces there was a fleet "A" in Berehaven commanded by Lord Walter Kerr, and another, "B," mobilizing in Kingstown and bound by similar conditions to those of "D." The relative value of these fleets was such that while "A" was superior in strength and speed to "C," and "B" to "D," "C" was superior in strength but not in speed to "B"; it follows, therefore, that "C" + "D" was superior to "A," but "A" + "B" was superior to "C" + "D." Away outside the Straits of Dover a Russian fleet was expected to arrive on a certain day, and it was the aim of the two French fleets "C" + "D" to join together and meet this imaginary fleet without first being destroyed by the British. To represent the attainment of this object it was necessary for the supposed French fleets to get into Lough Swilly unmolested. This feat Admirals Seymour and Wilson actually achieved.

The Plan of Campaign.

The only movements allowed prior to the receipt of advice from the Admiralty that hostilities were imminent concerned the torpedo craft. The British admiral was supplied with 20 destroyers and the French admiral with 24 torpedo boats. On either side it was allowable to place these vessels wherever considered most desirable. In the result these movements had no direct result upon the progress of the war and the destroyers were given by the rules so great an advantage over the boats that these latter were almost entirely confined to their ports. At noon on Friday, July 24th, permission was received from the Admiralty by either side to use cruisers for scouting, and both admirals took advantage of this to despatch their look-out ships to sea. The distance, however, from Berehaven to Milford was too great for the British cruisers to cover it before the declaration of war at midnight allowed Admiral Seymour to take his fleet to sea. Nevertheless his movements were seen by a destroyer, and a knowledge of them was carried to Lord Walter Kerr. The British admiral did not receive this news until three o'clock on Saturday, by which time Admiral Seymour was in the neighbourhood of Torbay, where he joined his friends at eight p.m. The inference to be drawn from this is that a superior and faster fleet at Berehaven will not, with only six hours' notice, be in a position to prevent an inferior and slower fleet escaping from Cherbourg and picking up reinforcements at Brest. By Sunday afternoon Lord Walter Kerr was in the channel, and his scouts had looked into Torbay and seen the two French fleets lying at anchor waiting until the period of mobilisation expired at midnight and would permit them to go to sea. As the British admiral was now inferior in strength to his enemies, although superior in speed, he fell back north of the Scilly Isles, to effect a junction with his friends. A question of course arises whether this was the best possible strategy. To this question no reply can be given, because, owing to the apparently contradictory manner in which the instructions for the game were drawn up, the British admiral read them in one way and his opponent in another. In actual warfare there can be no question that to lose touch of the enemy would be fatal. By the time that the British fleets were united at two p.m. on Monday, all trace of the enemy had been lost, and Lord Walter Kerr determined to place his fleet off Lough Swilly, and there await the arrival of the foe. In this case, when he knew where his enemy was going, this was perhaps the wisest plan, but it is to be remembered that in the case of the French fleets at Brest, their object might as likely be Toulon as the North Sea, and for this reason alone it would be necessary, having obtained touch with them, to maintain it. The British fleets, to get off Lough Swilly, went round the west of Ireland, in order that they might not run the risk of being torpedoed when passing through the enemy's waters, Admiral Seymour chose the same route, and the weather favouring him, he not only successfully evaded the hostile cruisers, but under cover of a misty, dirty night, he ran into Lough Swilly two hours before the time assigned for the end of the war.

Lessons of the Manœuvres.

It might be assumed by those who don't look beneath the surface that the great lesson here is that the chances in favour of the inferior fleet have been increased since steam has been substituted for sail power. And from this it might be argued that naval force has become less than ever a defence to territory. Nothing could be more fallacious than such reasoning. On the contrary, the whole tendency of the manœuvres is to show that if steam gives any advantage to the weaker side it gives treble that advantage to the superior fleet if properly utilised. There can be no question that in case of actual war, the increased celerity with which news can be transmitted must operate to the advantage of the stronger and quicker side. In this case the news of his departure and the direction taken by Admiral Seymour might have reached Lord Walter Kerr in less than an hour after the declaration of war, as a matter of fact it reached him in fifteen hours; but in the sailing times from four or five days would have been more likely. No! the most important lesson to draw from the manœuvres is the necessity for the study of tactics, especially cruiser reconnaissance and scouting It is absolutely essential to obtain and maintain touch with the enemy and there can be but little doubt that the number of cruisers now supplied to a fleet is barely sufficient for this purpose. "More frigates," cried Nelson, and "More cruisers" must not be allowed to be the cry of our future commanders in war. A writer in the *Times* dwells upon the necessity which exists in the Navy for the study of tactics, and that important branch of it, the scouting work of cruisers. He says, "It is the efficient discharge of the duties of cruiser reconnaissance which will rule success in naval war, and the present absence in the British Navy of all inducement to study these matters is a matter of grave concern." It is most satisfactory that there should not have been one serious breakdown of machinery during the three weeks which the manœuvres lasted. The trial of some of the ships, especially the older ones, was most severe, but beyond the development of small defects, in all cases repairable without the aid of a dockyard, everything went uncommonly well. The speed trials, for that is what the run of the fleets from one port to another amounted to, were satisfactory. It was shown, for instance, that with even the newest vessels if they are six months out of dock not more than fourteen knots speed must be expected, but if the older vessels are perfectly clean they may be relied on for eleven knots. The second-class cruisers of the Naval Defence Act fully maintained their reputation as thoroughly trustworthy for scouting or chasing purposes. The gunboat, or as it used to be termed, torpedo-boat catcher, although it is no use for the purpose this name would denote, and, in fact, is too slow for many purposes, yet has its uses and its value at times. The destroyers and the torpedo-boats in their several ways were able to demonstrate their respective sea-keeping capabilities. Finally a writer says, "These manœuvres should teach us clearly that no enemy is to be despised, that victory is not always to the swift, and that we are yet some way from that standard of strength which will give us security."

Portsmouth Dockyard.

The mobilization and other matters have made a busy time in this yard, but their Lordships appear to be entirely satisfied with the progress made. We are rather proud of the turnout of the *Sultan* and *Inflexible*, two vessels which have undergone considerable repair and alteration. The *Sultan*, on her speed trial, made 14 knots, and the *Inflexible* from 12·5 to 13 knots, which says a good deal for the machinery, and looks as if these will be valuable ships for some time to come. According to present arrangements the *Prince George* battleship will commence her steam trials very early in September. It is confidently expected that she will be the next ship of the *Majestic* class to be commissioned. The Channel Fleet ships in hand are to be away again by the end of the second week in September. The *Malabar* troopship, paid off here some months ago, has been commissioned as a coal hulk at Bermuda. The stern torpedo-tubes are to be taken out of all the ships of the *Royal Sovereign* class, so that these vessels will now only carry submerged tubes, and it is thought probable that this will be the rule in modern construction. It is pretty much of a race now between the *Prince George* and the *Victorious*, and so far we are well ahead, although the *Prince George* was not laid down until three months after the Chatham ship. This yard scored, however, because when there was some delay in the delivery of guns and armour, the Admiralty ordered that which was for the *Victorious* to be delivered at Portsmouth. All the heavy guns of the *Prince George* were on board before the end of July, and as the authorities ordered overtime to be worked both on this vessel and the *Cæsar*, no doubt they want to get them completed. The *Cæsar* will be floated out in October, but will take at least a twelvemonth after that to get her ready for the Fleet Reserve. Do what they will it is not likely the *Cæsar* will make a record. The *Gladiator* cruiser is making slow progress, and therefore it seems likely that the *Canopus* will not be begun this year. Her engines are to be built by Messrs. Scott & Co., of Greenock. The *Iphigenia* and *Indefatigable* are being made here for the pennant and will go to Australia. The *Nelson* has been commissioned at last and will be missed from the yard.

The Manning of the Navy.

Discussion on this important subject has been given an impetus by the controversies created by Lord Charles Beresford's lecture at Liverpool. His Lordship, it will be remembered, began by explaining that he was not making an attack upon the Admiralty, but because Mr. Goschen has not at once accepted his proposals, a bitter agitation has been begun which is in effect a most determined attack on the authorities. It is necessary to acquit Lord Charles Beresford of any part in this attack, he has merely supplied the ammunition and retired from the field to Norway, leaving his secretary to act as commander-in-chief of the forces. As to the gravamen of the charge it is this: Lord Charles in his figures makes out that so far as men in the regular service are concerned and including 11,200 for the new ships now building, there is a total deficiency of 27,562, including 5,000 engine-room ratings. It is unnecessary to enter into the question of whether these figures are exact or not, for it is generally admitted that there is a deficiency, and the official scheme for supplying it is by a steady and continuous increase of ratings. Any other plan, as has been pointed out by more than one writer of weight, will not only disarrange all the present facilities for accommodation, but will lessen the opportunities for training in the case of the men already in the service. Lord Charles Beresford admitted that there was no hurry, it is only his followers who have discovered that hasty legislation is necessary. To be considered apart from the requirements of the Regular service there is the Reserve, and recently arrangements have been made for giving this force further and better training than was formerly the case. Some of the Reserve men are being engaged for fixed periods, and will thus obtain a knowledge of life on board a man-of-war. Altogether the Reserve may be said to be improving. But Lord Charles Beresford wants to introduce a short service scheme of his own, which is to supply a temporary number of active service men, provide a reserve, and raise the status of the Mercantile Marine at one swoop. He would enter 5,000 men for a service of five years in the Navy, with a subsequent retaining fee as a first-class Reserve, and other 5,000 men each year to have two months' training, of which one afloat, as a second-class Reserve, thus securing 30,000 men at an estimated cost of £600,000. Extending the system over eleven years he would hope to secure 70,000 men at a total cost of £3,740,000, or adding the cost of training, of £1,440,000 a year. His Lordship would like to see 15,000 men entered next year, 5,000 Marines, 5,000 first Reserve men, and 5,000 regulars to make up for waste. By this scheme he hopes to make the Navy a nursery for the Mercantile Marine, and to see all subsidised vessels carry Reserve crews.

Chatham Dockyard.

To say that the activity with which the year begun still continues at this yard is a commonplace to all who have paid it a visit. Certainly no one can walk round the docks and ships without being impressed with the busy aspect of everything. Of the vessels in hand the *Victorious* is making rapid progress towards completion. Three of the heavy guns have been mounted, and it is anticipated that the remaining one will be on board and her trials begin early in September. The military tops and platforms are complete masts fitted with signalling apparatus, and the gun shields on board. The *Illustrious* would have made more progress had it not been for the delay in the delivery of armour plates. It is still hoped that she will be fit for floating in November next. As soon as possible the *Goliath* battleship will be begun on the slip from which the *Victorious* was launched. The *Leander* and *Arethusa* are both in hand here, the latter being fitted with a quick-firing arrangement. Some little work there has been in connection with the torpedo-boat destroyers which are to be sent out of Portsmouth as tenders to ships in the Mediterranean and China. The basins are now full of ships, but several of these are on the point of commissioning. Of new cruisers the *Minerva* is now out of the hands of the Chief Constructor, and the *Vindictive* is being pushed forward in her place. The cruiser *Endymion* has been prepared for relief service here, and has left for Malta with new crew for the *Hawke*. The *Northampton*, boys' sea-going training ship, was also in hand for a short time, and has now left for another recruiting cruise. The *Venus*, built by the Fairfield Co., was delivered here some weeks ago, and is now to be taken in hand for fitting; her trials have been very successful. The men are now being sent back to the *Vindictive*, but she is behind time, just as the *Minerva* is behind her sisters the *Eclipse* and *Talbot*. The cause of the mishap to the crown plates of her boilers is said to have been facing the fires too hastily without sufficient time for the plates to expand. The *Tribune* is being prepared here for service in Australia.

The "Powerful" and "Terrible."

The contractor's trials of the *Terrible* came to an untimely end owing to defects in the machinery, and long before any attempt had been made to develop the full specified H.P. The cause of the defect is variously stated, one report stating that it was due to an insufficient allowance for the expansion which always follows alternate applications of heat and cold to the metal used in the construction of the machinery. It is also said to have been caused by the circumstance that the intermediate cylinders of the *Terrible* are fitted with flat slide valves instead of those of cylindrical shape, and that the relief or vacuum rings of these valves got out of order, and under the steam pressure the valves broke down. Whatever the cause no blame is to be attached to the boilers. While the necessary alterations are being made in the *Terrible*, her sister ship will be tried. The *Powerful* was undocked on July 19th at Portsmouth, having been sheathed with copper, had her under-water fittings examined, and her submerged torpedo tubes fitted on board. Most of the mountings for her 6-in. guns were in place, but in neither this vessel nor the *Terrible* have the 9·2-in. guns, which are to be worked with electric motors, yet been mounted. A new method for arranging the screw propellers by these cruisers is being tried. In nearly all our men-of-war the twin-screws are so arranged that when the engines are moving ahead the screws turn outwards from the line of keel. In these cruisers the reverse is the case. It has been feared that this plan might adversely affect their steering qualities, but this has not yet been found to be so, in fact, the steering of the *Terrible* through the fleet at Spithead was noticed by onlookers as a splendid exhibition of handling a big ship. The trials of the *Powerful* will take place as soon as those of the *Prince George*, which are to begin September 7th, are completed, and it is estimated these will take at least a fortnight. The *Powerful* will make a first run of not less than thirty hours duration at 5,000 I.H.P. for the purpose of ascertaining the coal consumption at this power, and another run will follow for the same purpose, but at 18,000 H.P., and then if these runs are satisfactory, the vessel will be steamed for four hours at the full specified H.P. of 25,000. After this a further run, but of only four hours, will be made with 22,000 I.H.P. It is anticipated that the Duke and Duchess of York will proceed to Australia in either the *Powerful* or *Terrible*, escorted by the *Blake* and *Blenheim*.

Devonport and Keyham Yards.

Although the selection of Sir Edmund Freemantle as the successor of Sir Algernon Lyons was rather in the nature of a surprise, since it was well-known that Sir Edmund's wishes were in the direction of the Mediterranean, he is making a most popular Commander-in-Chief, and at the same time keeps the port booming. The report that the *Renown* would be commissioned for the manœuvres did not meet with much credit here, as it is well known that mobilization knocks the gingerbread off a ship a good deal, and Sir John Fisher will want to hoist his flag on a spic and span vessel. Seeing that this vessel only came round from Pembroke last November, that she is ready for sea is very creditable to the yard. Now the *Arrogant* has been launched the only ship under construction here is the *Furious*, her sister, laid down in June last year, she will be ready to leave the slip during the ensuing month. The *Talbot* has been commissioned to relieve the *Magicienne* in the West Indies, and this takes the pride of the yard away. It would pay the authorities well to order another *Talbot* right away. The reconstruction of No. 3 slip has been begun, and it is hoped that the keel plate of the *Ocean* will be laid here on December 28th. The engine for this vessel will be made by Messrs. Hawthorn, Leslie & Co. The last chapter in the naval manœuvres is the paying off of the vessels after mobilization, but the number of ships to hoist the pennant here being small, this has not made a great deal of work one way or the other in the yard. The *Aurora* is to be taken in hand here for service on the China station, and the *Sirius* for a commission in Australasian waters. A scheme has received official sanction which will have the effect of doing away with the powder magazine vessels above Saltash Bridge. New storehouses have been erected at Ball Point and the substitution of cordite for powder makes it less dangerous to house these stores on shore.

The Commemoration of Trafalgar.

On July 20th the secretary of the Navy League wrote a circular letter to most of the daily papers in this country and the colonies, proposing that throughout the Empire on October 21st next, the battle of Trafalgar, which assured to us maritime supremacy and commercial prosperity, shall be commemorated by decorating the statues of the great Admiral and in other ways. This proposal for a public celebration of Trafalgar day has in the popular phrase "caught on," and is being taken up with enthusiasm in many quarters. As last year the Nelson Column in Trafalgar Square is to be decorated, and it is hoped that the Naval authorities will consent to provide a guard of honour of bluejackets for the occasion. Lord Drogheda is in hopes that the Admiralty will order a naval review in Hyde Park, in which case it is suggested that the men should be publicly entertained. There are to be thanksgiving services at various cathedrals, and great efforts are being made through municipal bodies to stir up general interest in the celebration. Anything tending to make our countrymen familiar with what the Navy has done, and what we must depend upon it to do, cannot fail to be useful, and the Navy League is therefore to be commended for the good work it has in hand. Trafalgar was the crown and completion of a long series of operations, many of which were carried out by men who had died before Nelson was born, and it is quite as necessary to impress this on the public mind as to do homage to the great Admiral. In this connection we note that Professor Laughton has in the press an illustrated memorial volume of the life and death of Nelson, entitled, "Nelson and his companions in arms." The work will give concise biographical and historical accounts of Nelson's life, times and companions in arms. It will contain over fifty illustrations in photogravure, half-tone and line, including about thirty autograph signatures of those intimately associated with him in his career, four plans of battles, and a reproduction in colour of the famous signal, "England expects that every man will do his duty."

Sheerness Dockyard.

As usual the manœuvres have brought this yard a great deal of small refitting. I must not, however, include in this category the *Landrail*, where a good deal of new work had to be executed. Overtime was at first worked on her, but this was soon found unnecessary, and she will now be ready again for service by the second week in September. The *Swallow*, paid off here at the end of July, is to be prepared for another three years commisssion, and it seems likely that she will take the place of the *Dolphin* in this year's programme. The general idea is that she is to be used for the training service. The *Speedy* has been in hand for small defects, and the *Blenheim* and *Charybdis*, also of the Channel Fleet, have been here to give leave, and as usual have wanted a little doing before they leave for Malta as escort for the destroyers and torpedo-boats going out there. The *Wye* has taken her departure, and she is so often here that we are bound to miss her. Several changes have also taken place in the flotilla of torpedo-boat destroyers owing to some going abroad, and this delicate piece of mechanism require frequent looking after. The trials of the *Pelorus* are expected to commence about September 15th, and will attract considerable attention not only at the first of a type, but because she is supplied with water-tube boilers. Her machinery was built by Messrs. J. & G. Thomson, Clydebank, and it is estimated she will develop 7,000 H.P. at forced draught and make 20 knot speed. Under natural draught her engines are to indicate 5,000 H.P., which should give her a speed of 18·5 knots. The *Pelorus* has made good progress towards completion. The *Proserpine*, her sister ship, represents all the building now going on here. She is to be launched before the end of the year. The *Dolphin*, *Barracouta*, and *Gleaner* are all expected here for refit, and now that the *Egeria* is finished off we shall be glad of them.

Our Fleets on Foreign Stations.

Much has been accomplished of late years in the way of increasing our forces on foreign stations, but still more remains to be done in this direction. It is more than ever necessary that our seamen should have training at sea, and that as we increase in personnel we should place more ships in commission in which officers and men can gain the essential experience. Moreover, we have to recollect that other nations have not been standing still. Russia has now a very large and strong force in the Pacific, the fleets of the United States are more powerful than they were a few years back, and many of the smaller foreign Powers have augmented their navies. The British Mediterranean fleet is now stronger than it has ever been before, the Particular service squadron having joined in, so that three British Admirals' flags are now flying in these waters. There are now twelve battleships in commission in the Mediterranean, which is not one too many, there are also twelve cruisers, a proportion which would have to be doubled in war time. Hitherto, there has only been one destroyer, the *Ardent*, attached to the *Ramillies*, but now four more are to be dispatched to the station, and will be allotted as follows: the *Banshee* to the *Nile*, the *Boxer* to the *Trafalgar*, the *Bruiser* to the *Hood*, and the *Dragon* to the *Barfleur*. On the China station a gradual increase of force has been made by sending heavier ships to the relief of older or less powerful vessels. A further change is to be made in this direction by the substitution of the *Aurora* for the *Porpoise*. Two destroyers, the *Handy* and *Hart*, are also to be sent to this station to be attached, when they arrive, to the *Centurion* and *Grafton*. In the North America and West Indies station, the substitution of the *Talbot* for the *Magicienne* is an increase of power, and no doubt further changes here will be carried out shortly, as at present the newer ships are few in number. On the Australian station also, the four cruisers of the *Katoomba* class at present there will be relieved by the *Indefatigable*, *Iphigenia*, *Tribune* and *Sirius*. The former, when they come home, will probably be employed as drill ships for the R.N. Reserve, and it is understood that one of them will be stationed at Bristol. It is in contemplation to attach all the drill ships to the flag of the Admiral Superintendent of Reserves, and like the gunboats which have recently been made coastguard tenders, to call out all these vessels annually for sea service during the manœuvres. At home it is to be noted that not only is the Channel Squadron now more powerful and more numerous than it has ever been before, but a very large number of effective vessels, including destroyers, are employed in the training service, and are virtually in commission for active service.

Pembroke Dockyard.

It was originally the intention of the Chief Constructor to begin the work of sheathing and coppering the *Adromeda* early in August, but a delay has taken place and now it is more likely to be commenced in September. Whenever it is practicable to begin plenty of men will be put on, and the job expedited as much as possible. The tug *Storm Cock*, which has for many years been employed in connection with this yard, has now been taken away for service at Malta and is to be permanently stationed in the Mediterranean. The last of the armour plates of the barbettes of the *Hannibal* have been placed in position and secured. The work was done very smartly and creditably. According to the Naval Estimates the only vessel to be laid down in this yard is a cruiser similar to the *Andromeda*, but preparations are now being made to build another *Hannibal* on No. 5 slip, while the cruiser will be built on No. 1 slip after the *Andromeda* is launched.

Channel Fleet Inspection.

Although there was no naval review in honour of Li Hung Chang, as it was at one time thought would be the case, an opportunity was afforded the great Chinese statesman for seeing some of our finest vessels. At the same time the return of the Channel Squadron, augmented as it had been for the manœuvres, to Spithead was utilised to parade the fleet before the Queen; and Her Majesty, the Prince and Princess of Wales, and other less notable personages, made a tour of the ships on subsequent days. The arrival of the fleet was made the opportunity for a splendid display of seamanship, the vessels passing Osborne in single file, and then turning back to Spithead, assuminga four-line formation in which they anchored simultaneously. On Wednesday Lord Walter Kerr made a signal from the *Majestic*: "I am desired by the Queen to express to the fleet her pleasure at the appearance of the ships on the occasion of her visit to Spithead on Tuesday." The Prince of Wales also, on concluding his inspection on Wednesday, signalled from the yacht: "I am much gratified with reception and the magnificent appearance of the fleet." The fleet was indeed a magnificent one, and well worthy of the encomiums of royalty. There have been greater gatherings of vessels in the historic anchorages, but no fleet has ever anchored there which excelled the one under the command of Admirals Lord Walter Kerr and Armand Poulett in homogeneity and composition, and the modern character of its component parts. Altogether the spectacle afforded the visitors—for in addition to her Mejesty and his Royal Highness the Prince of Wales, Li Hung Chang, a party of members of Parliament, and many other sightseers made a tour of the fleet—was full of interest and instruction.

Navy Employment Agency.

I am asked to call attention to a work that is being entered upon by a new association called the Navy Employment Agency. The purpose is to secure employment on shore for time-expired men of the Navy and Marines of good character. The agency is conducted by a committee of the Castaways' Club, a dining club composed entirely of naval officers who have resigned their commissions, but who wish in this way to show their continued interest in the service to which they belonged. The agency should become a useful means of communication between employer and the unemployed, and the former will do well to write to Commander Ernest Kinder, R.N., of Craig's Court, Charing Cross, the secretary of the agency. None but men of thoroughly good character are entered on the books, and not only do bluejackets make excellent servants, but in these days of motor cars, &c., good drivers in plenty should be obtained from this source, for the engine-room complement is not forgotten.

Sir Christopher Furness, Westgarth & Co., Limited, have acquired the businesses of Westgarth, English & Co., and of the Tees Side Iron and Engine Works Co., Limited (except so far as the Bridge Building and Blast Furnaces are concerned), from 1st July, 1896. The new company take over all current trade contracts, and will carry on the business.

LAUNCH OF H.M. TORPEDO-BOAT DESTROYER, "STAR."

On August 11th Her Majesty's torpedo-boat destroyer *Star*, was launched from the Howdon yard of the Palmer Shipbuilding and Iron Co., Limited. The vessel is the first of eight of the same class which are being built by the Jarrow firm for Her Majesty's Navy. Her dimensions are:—Length, 215 ft.; breadth, 20 ft. 9 in.; and the displacement is about 300 tons. Her armament consists of one 12-pounder quick-firing gun forward on the conning tower, with four six-pounder quick-firing guns on the broadside, and one six-pounder on a platform aft. There are also two revolving torpedo tubes on deck, arranged to fire on either broadside. The builders have guaranteed a speed of 30 knots per hour, and the machinery, which has been designed by them, consists of two sets of triple-expansion engines, steam being supplied by four of Reed's patent water-tube boilers. The christening ceremony was gracefully performed by Mrs. Cleveland, wife of Admiral Cleveland, one of the directors of the Palmer Co. Amongst those present were Admiral and Miss Cleveland, Mr. and Mrs. J. D. Milburn, Mr. and Mrs. A. M. Palmer, Mr. John Hall, Mr. and Mrs. F. S. Newall, Mr. and Mrs. Spicer, Mr. Sclater, Mr. and Mrs. Charlton, Mr. and Mrs. Redmayne, Mr. Norman Redmayne, Mr. M. Dodd and Miss Dodd, Messrs. Absey and Matthews (Admiralty overseers), Mr. H. Rowell, Miss Morey, Mr. and Mrs. Snowball Innes, Mr. S. Ramsay, Mr. C. J. Potter, Mr. J. P. Wilson, and Mr. and Mrs. P. A. Berkley. After the launch, those present adjourned to the offices.

RAE'S PATENT CABLE SHACKLE.

We recently inspected, at the offices of the Patent Shackle Syndicate, Limited, Bush Lane House, Cannon Street, E.C., an ingenious form of shackle link, which has already met with the sanction and approval of the Board of Trade and Lloyd's, and has been ordered for trial by the Admiralty.

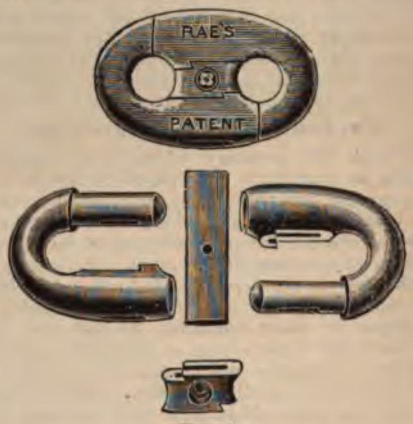


Fig. 3.

As will be seen from Figs. 1 and 2 of the accompanying illustrations, the patent shackle is very much less cumbrous than the present form of shackle, the former being in fact, as regards its shape and size, practically identical with any other link in the chain in which it is to be employed, thus allowing it to work with perfect ease and safety over the windlass, or capstan, while it travels as freely and smoothly through hawse pipes, stoppers, etc., as any other part of the cable can do.

The patent shackle is as easily connected and disconnected as the ordinary shackle, and its use does away with all enlarged end, and intermediate links, and as each of Rae's shackles is made of special steel and tested far beyond the regulation strain, and supplied with Board of Trade certificate to that effect, it follows that they can be used as "emergency" links, and the cable put into use at once without the trouble and expense of having to send it home for re-passing by the Board of Trade, and thus a cable need not be invalidated.

The patent shackle is built up, as shown in Fig. 3, of five parts, each made of special steel, the whole when fitted being held together by the collar, of specially hard steel, which passing through the centre is secured by a transverse pin and leaden pellet in the ordinary way. The centrepiece and the two half-links are, as it were, dovetailed into one another, so as to bring the strain on to the shoulders thus formed in the different parts instead of on to the collar.

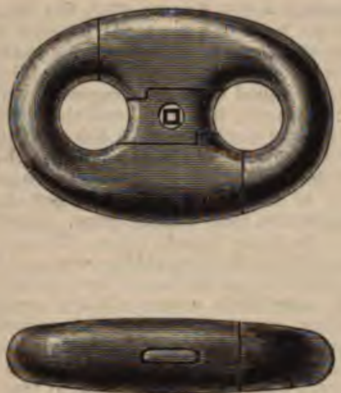


Fig. 1.

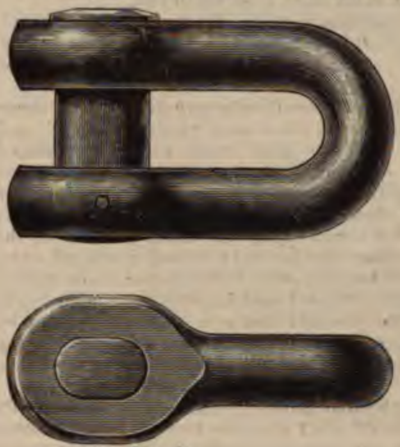


Fig. 2.

We were shown samples of these shackles which had been proved to even beyond the breaking strain of the cable; they were designed for use with and beyond a slight elongation. The ease with which they could be connected and disconnected had suffered no diminution, in fact, it is more than probable that every link in the cable would have given out before the shackle.

UNUSUAL CORROSION OF MARINE MACHINERY.*

By Mr. HECTOR MACCOLL, of Belfast.

Corrosion in Marine Engines and Boilers is usually confined to well-known parts, is not rapid in its action, and may be prevented or stopped by the adoption of suitable measures. In a recent instance its action was so wide-spread, so rapid, and so powerful, as to render a short description of it somewhat interesting to engineers.

Steamer.—The steamer *Glenarm* is a steel vessel of the long raised quarterdeck type, built in Belfast in 1890 for the Antrim Iron Ore Co.; and is engaged in their trade between Belfast and ports on the north-east coasts of Scotland and England. She is classed 100 A1 in Lloyd's register, with a deadweight capacity of about 800 tons; and her machinery consists of three-crank triple engines with cylinders 17 in., 27 in. and 44 in. diameter by 30 in. stroke, a three-furnace single-ended boiler of the usual type loaded to a pressure of 165 lbs. per square inch, and a single-furnace horizontal multitubular donkey boiler. The shafting and other forgings are all of iron; the boilers are of steel, with iron tubes.

Submergence. — On Tuesday, 24th December, 1895, this steamer, carrying a cargo of about 650 tons of "burnt ore" from Irvine to the Tyne, struck on a rock in the Sound of Mull, and was at once beached in Scallaster Bay, where the sea stood a little over her after-deck at low water, and close up to her bridge deck at high water. On the following Monday, 30th December, after having been submerged six days, she was pumped out and raised. On the same day steam was got up in the main boiler; but when about 30 lbs. pressure had been reached, the steam valve on the donkey pump blew out, and it was found that the copper at the bend of the donkey feed-pipe next the main boiler had disappeared; fires were therefore drawn, and the boiler blown off. On Friday, 30th January, 1896, all leaks having been so far reduced as to be under control of the salvage pumps, the vessel left in tow for Belfast, where she arrived early on Saturday morning, all the salvage operations having been successfully conducted by Capt. Bachelor, of the Liverpool Salvage Association.

Cause of Corrosion.—On examination the machinery was found to present an extraordinary appearance: all wrought-iron work was deeply and roughly corroded, and planed cast-iron work rendered so soft as to be easily cut with a knife. These unusual effects were undoubtedly caused by the cargo of "burnt ore"; and the following explanation has been contributed by Mr. S. Courtney, chemist, of Messrs. Francis Ritchie & Sons, Belfast, who investigated the subject at the request of Mr. Robert Browne, secretary and manager of the Antrim Iron Ore Co. "Burnt ore is the residue from the manufacture of vitriol from sulphur pyrites, and is generally found to contain about 4 per cent. of sulphate of copper, together with a little sulphate of iron due to the sulphur not having been completely burnt out of the ore and becoming oxidized into sulphates. The sulphate of copper would be more or less completely dissolved in sea water; and as the latter contains a considerable quantity of chloride of sodium or common salt, this would re-act on the sulphate of copper, forming sulphate of sodium and chloride of copper. The sulphate of copper and chloride of copper are both soluble in water; and a solution of either, or both, dissolves wrought-iron and cast-iron. The chloride is more energetic in its action than the sulphate; but in time a solution of either, no matter how weak, will dissolve an atom of iron for every atom of copper present. Every hundred tons of cargo contained as much sulphate of copper as would, if available, dissolve nearly 32 cwts. of metallic iron. The burnt ore might also contain a small quantity of free sulphuric acid, which would combine with the soda of common salt in the sea water, and set free hydrochloric acid; and the latter would rapidly act upon copper or brass."

Extent of Corrosion.—On the condition of affairs being discovered, the engines and boilers, as well as the hull, were at once opened up for survey, the underwriters being represented by Mr. Henry H. West, of Liverpool, and the owners by Mr. James Maxton, of Belfast; the entire work on the hull and machinery was afterwards carried out under the direction of the latter. The general condition of the engines was that wrought-iron work had been penetrated by corrosion to a depth of about 3-32nds in., and planed cast-iron so softened that 1-8th in. had to be taken off before a hard surface was regained. Surfaces in bearing contact, or with oil between them, and all painted surfaces, were completely preserved. The detailed condition of the various parts, and the measures taken to restore them, were as follows:—

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* Read at the Summer Meeting of the Institution of Mechanical Engineers in Belfast.

Cylinders.—These had partially filled through the hot-well, and from the drain cocks being open. The lower part of the intermediate cylinder was softened for 12 in. up, and was re-bored ¼ in. larger in diameter, and the piston altered to suit. The piston-valves and liners in the high-pressure and intermediate cylinders were softened at their lower ends; the liners were re-bored, and the valves fitted with new rings. The lower edges of the low-pressure slide-valve and face were also softened; the valve was planed, and the lower bar of the face chipped off and replaced by a brass strip pinned on. In all other respects they were sound and good.

Piston-rods and Connecting-rods were turned all over, reduced 3-16ths in. in diameter, and the former fitted with new neck and gland bushes.

Guides had 1-8th in. planed off them before a hard surface was reached; and the guide shoes were lined up to suit.

Valve Gear is of the Hackworth type. The valve-spindles and various rods were turned all over, to remove the deep pitting; the angle blocks had their planed surfaces reduced 1-8th in., and the various parts lined up to suit.

Shafting.—The crank webs were deeply corroded; but as there was ample strength, they were filled with "hard stopping" and painted. The shaft journals and crank pins were pitted longitudinally in the exposed spaces between the white-metal strips, and were also pitted transversely at the clearance spaces next the crank webs; these were cleaned out, filed up, and the bearings adjusted. The thrust shaft was much corroded at the exposed parts of the collars and journal; it was turned all over, and the horse-shoes and bearing were re-filled with white metal. The intermediate length of tunnel shafting was much corroded at the exposed part of the journal; and as it was also reduced by wear, a new journal was turned further forward, and the bearing shifted to suit. The propeller and propeller-shaft were found in good order.

Auxiliaries.—The centrifugal pumping engine was considerably wasted in the rods, guide, &c.; and was treated like the main engines. The duplex pumping engine and donkey-boiler pump were so seriously corroded as to be useless, and they were replaced by new. The brass steam-valve and one pet-cock of the duplex pumping engine were curiously wasted into holes; and the check-valve and seat on the main boiler had the appearance of some substance, probably zinc, having been sucked out of them.

Pipes.—From the appearance of the donkey copper feed-pipe it was feared that all the copper pipes were seriously affected. A similar bend in the main feed-pipe was therefore sawn through, but was found to have suffered no deterioration. All the pressure pipes, however, were taken down, tested, and annealed; no defects were detected, and they were all replaced. But in putting together the various steam and vacuum gauges the small connecting pipes were found in several places to be curiously wasted below the coupling nut.

Small Details.—It is unnecessary to enumerate the bolts, nuts, cock handles, spanners, and such small details, which were wasted into mere shadows of their former selves, and had to be renewed.

Boilers.—The safety-valves of the main boiler having been eased when the vessel was beached, the boiler had filled with water; and the condition of both boilers looked serious. The front end plate of the main boiler was considerably wasted; the furnaces, which are of the spiral corrugated type, had corrosive scores running in the direction of the corrugations; and the tubes were covered with a deposit of what appeared to be pure metallic copper. In the end, however, after careful drilling and gauging, it was found that an unexhausted margin remained in all except the tubes. These were all found to be seriously corroded in both boilers, and every tube was therefore cut out and renewed; after which the boilers were satisfactorily tested.

Steam Trial.—Although the utmost vigilance and care had been exercised in examining as far as possible every point and detail, latent defects might have existed; and it was not with complete confidence that steam was again raised and the machinery tried. Neither then, however, nor in the months of continuous service which have since elapsed, has the slightest defect been perceived; and the machinery is now, thanks to its thorough overhaul, working with the efficiency and economy which it possessed when new.

Conclusions.—The lessons to be learnt from this experience are probably obvious enough. Some of them are for the shipowner rather than the engineer, and therefore need hardly be referred to here; but it may be well to emphasise two of the others.

First, the advantage of having, in marine engines and boilers, a small margin over the actual requirements for strength. In the various rods, shafts, and similar parts, such a diameter as would allow them to be skimmed up; in the cylinders, valves, &c., such thickness as would allow them to be bored or planed afresh; and in the furnaces, combustion chambers, and stays, a slight excess of thickness over that required by the rules.

Second, the advantage of good paint. Many engineers prefer polish to paint; but in this instance the latter truly cost little, and was worth much.

Barrozo.—On August 26th Sir W. G. Armstrong & Co., Limited, launched from the Elswick shipyard, Newcastle-on-Tyne, the *Barrozo*, a cruiser built to the order of the Brazilian Government. She is built of steel, her under-water portions being sheathed wood and coppered. Her principal dimensions are:—Length, 330 ft.; breadth, 43 ft. 9 in.; draught, 16 ft. 10 in.; and displacement, 3,450 tons. The *Barrozo* will be provided with guns of Elswick pattern, the armament comprising six 6-in. quick-firers of 50 calibres in length, four 4·7-in. quick-firers of 50 calibres, ten six-pounder and four 1-pounder Nordenfelts, four Maxim guns, and two field guns. She will also have three torpedo tubes. The six 6-in. guns are arranged to fire three ahead and three astern. She is protected throughout the whole of her length by a curved steel armour deck. This deck completely covers all the machinery, magazines, and steering gear, and additional protection is afforded by the reserve coal bunkers, which are carried along the vessel's side to a height of about 6 ft. above the water line. With full bunkers the vessel will be able to traverse a distance of about 8,000 knots at a moderate speed. The vessel is fitted with twin screws and machinery of 7,500 I.H.P. She is expected to attain a speed of 20 knots.

The approximate traffic return on the Manchester Ship Canal for July states that the total receipts were £16,602, against £12,504.

Magnolia Metal.—The impression sought to be made that this metal is no longer being supplied to the trade, or to those desirous of using it, is quite contrary to fact. We have received a removal notice from the Magnolia Anti-Friction Metal Co., of Great Britain, Limited, that they are now carrying on the business of supplying this metal, as sole licencees for the sale in Great Britain, her colonies and dependencies, and in Continental Europe, under the original patents at 49, Queen Victoria Street, London, E.C. In the meantime the records of this metal, as an anti-friction metal, have not been standing still. We see that so late as August 20th, 1896, this company has obtained a splendid testimonial from Messrs. J. & H. McLaren, that when testing their 200 H.P. electric lighting engines for the South Shields Corporation upon the brake in their works for brake H.P., the main bearings and connecting rods being fitted with Magnolia metal bearings, they obtained the remarkable efficiency of 94·2 per cent., which we should imagine is quite a "record" efficiency—most creditable both to the workmanship of Messrs. McLaren's engines and to the anti-friction character of the bearings.

The Strike at Chiswick.—A further meeting of the boilermakers involved in the dispute which has occurred at Thornycroft's Torpedo-boat Building Works was held at Chiswick on August 26th, to consider the proposal of the firm that the remaining points should be referred to Sir Benjamin Baker for arbitration. The proceedings were private, but it was afterwards stated by the officials of the union that their members had decided to accept the proposal, and that all the boilermakers who were out on strike, together with the labourers who had been thrown out of employment in consequence of the dispute, would resume work.

NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from July 28th to August 26th, 1896:—

Agnew, T., staff engineer, has been promoted to the rank of fleet engineer in Her Majesty's fleet.

Allden, Frank A., engineer to the *Haughty*, to date August 18th.

Alton, George B., staff engineer to the *Talbot*, to date September 15th.

Andrew, George E., assistant engineer to the *Pembroke*, additional, to date August 14th.

Andrews, Harry G., engineer to the *Hardy*, to date August 18th.

Apps, William R., chief engineer to the *Pembroke*, additional for the *Brilliant*, to date August 18th.

Arthur, John F., assistant engineer to the *Victory*, additional for the *Terrible*, to date July 30th.

Ball, Ralph H. C., engineer to the *Nymphe*, to date September 17th.

Barry, James H. D., engineer to the *Hawke*, when recommissioned, undated.

Bell, Henry, assistant engineer to the *Talbot*, to date September 15th.

Bevan, William J., staff engineer to the *Hood*, when recommissioned, undated.

Bills, W. H. T., fleet engineer to the *Malabar*, to date August 25th.

Bramsdon, William J., staff engineer to the *Victory*, additional for gun and torpedo boats, to date August 6th.

Brown, Percival R. T., assistant engineer to the *Endymion*, to date August 18th.

Bull, Ralph H. C., engineer to the *Victory*, for the *Nymphe*, to date August 6th.

Butcher, John B., engineer to the *Resolution*, to date August 18th.

Campbell, Edward J., engineer to the *Pembroke*, to date August 8th.

Carlisle, Archibald H. (probationary) assistant engineer to the *Vivid*, additional for the *Renown*, to date August 19th.

Cornish, Edwin, staff engineer to the *Hawke*, additional for recommission, to date August 18th.

Cudlip, Edwin W., engineer to the *Bruiser*, to date August 18th.

Drought, Arthur E., assistant engineer to the *Pembroke*, additional, to date July 31st.

Dunn, C. F., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Dupen, A. P. L., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Edwards, E., engineer to the *Excellent*, additional, to date August 6th.

Fryer, George H., engineer to the *Sharpshooter*, to date July 30th.

Garwood, Harry T., engineer to the *Victory*, additional for the *Mars*, to date August 13th.

Garwood, Hugh S., assistant engineer to the *Magdala*, to date August 13th.

Glanville, William, engineer to the *Wildfire*, additional for the *Contest*, to date August 18th.

Glasspole, W. H., assistant engineer, has been promoted to be acting engineer in Her Majesty's fleet.

Godbeer, S., engineer, has been promoted to the rank of chief engineer in Her Majesty's fleet.

Godbeer, Samuel, chief engineer to the *Pembroke*, additional for service in dockyard, to date July 5th.

Graham, Francis (probationary) assistant engineer to the *Hawke*, when recommissioned.

Hamm, Richard S., fleet engineer to the *Endymion*, to date August 18th.

Hart, W., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Hefford, E. O., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Hill, Charles H., engineer to the *Banshee*, to date August 18th.

Howe, Percival C. W., assistant engineer to the *Barfleur*, to date August 13th.

Jackson, Thomas P., engineer to the *Hunter*, to date August 18th.

Jenkins, John E., chief engineer to the *Victory*, additional for the *Gladiator*, to date August 6th.

Johnson, J. R. D., staff engineer, has been promoted to the rank of fleet engineer in Her Majesty's fleet.

Kelly, Frederick (probationary) assistant engineer to the *Cambrian*, additional, to date August 18th.

Knapman, Henry T., engineer to the *Pembroke*, additional, undated.

Kilpatrick, Robert (probationary) assistant engineer to the *Endymion*, additional, to date August 18th.

Larg, James C., fleet engineer to the *Colossus*, to date August 4th.

Laverne, Sidney M. B. (probationary) assistant engineer to the *Hawke*, when recommissioned.

Lawrance, W. W., engineer to the *Victory*, additional for the *Daring*, to date August 18th.

Lewis, Edward E., assistant engineer to the *Hood*, when recommissioned, undated.

Little, E., staff engineer, has been promoted to the rank of fleet engineer in Her Majesty's fleet.

Little, John A., assistant engineer to the *Hawke*, when recommissioned, undated.

Massey, J. T. (probationary) assistant engineer to the *Victory*, for the *Terrible*, to date August 8th.

M'Carthy, John, fleet engineer to the *Vivid*, additional for the *Agamemnon*, to date August 4th.

Metcalfe, Henry W., engineer to the *Vivid*, for the *Earnest*, to date August 18th.

M'Ewen, George, fleet engineer to the *Cambridge*, additional for the *Hecate*, to date August 4th.

Moorshead, H. B., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Moss, F. S., assistant engineer, has been promoted to be acting engineer in Her Majesty's fleet.

Mountifield, J., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Nicholson, Gilbert C., engineer to the *Talbot*, to date September 15th.

Onyon, William, engineer to the *Hasty*, to date August 18th.

Osborne, Charles E. H., engineer to the *Hood*, additional, for appointment when recommissioned, to date August 18th.

Pearson, John C. (probationary) assistant engineer to the *Resolution*, to date September 17th.

Pendleton, Frank R. (probationary) assistant engineer to the *Hawke*, when recommissioned.

Raper, Robert S. J., engineer to the *Skate*, to date August 18th.

Rattey, W., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Rees, John D., chief engineer to the *Vivid*, additional for the *Thames*, to date August 4th.

Richards, John A., engineer to the *Ranger*, to date August 18th.

Rodet, Ernest W., engineer to the *Hart*, to date August 18th.

Rogers, C. R., engineer to the *Colossus*, to date August 8th.

Sagar, E. L., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Salter, Albert G. V., assistant engineer to the *Alexandra*, to date August 10th.

Saunders, Alfred, assistant engineer to the *Pembroke*, additional, to date August 14th.

Sheen, C. C., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Shorey, Charles E., engineer to the *Dragon*, to date August 18th.

Stainton, G. H., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Stainton, G. H., engineer to the *Crescent*, undated.

Sutton, Arthur W., assistant engineer to the *Victory*, additional as instructor in the workings of the machinery of torpedo-boats, to date July 30th.

Wall, Henry M., assistant engineer to the *Nymphe*, to date September 17th.

Wallace, Charles J. M., assistant engineer to the *Hood*, when recommissioned, undated.

Wallis, W. A., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Watson, J. H., engineer, has been promoted to the rank of chief engineer in Her Majesty's fleet.

Whayman, W. M., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Williams, Walter K., engineer to the *Boxer*, to date August 18th.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(*From our own Correspondent.*)

THE engineers of Messrs. Dunsmuir & Jackson, Govan, and the London and Glasgow Engineering Co., Govan, have made demands on their employers for the dismissal of one or two non-union hands, unless these objectional persons joined the society. The employers very properly refused to sacrifice any employee to the unionist demands, and the men went on strike. It was about this time last year the dispute was ripening that led to the memorable strike, when it was generally believed one great result of that strike or rather of the settlement which brought the strike to a close, was that sectional or "shop" dislocation would be avoided in the future. Indeed, it was a sort of understanding under the settlement that in no engine-shop in future would men who fancied they had a grievance cease work before submitting their case to the officials of the A.S.E. These troubles have been a peculiar feature of the engineering trade, and it has been the weakness of the society, that its constitution gave local autonomy to the districts.

The employers, finding argument and expostulation in vain, referred the matter to their Federation, who formally approached the Executive Council of the A.S.E. That body promptly ordered the men to resume work pending the consideration of their case. At the works of the London & Glasgow Co. the order was obeyed, but at Messrs. Dunsmuir & Jackson's works the men re-affirmed their resolution not to resume work, while the employee to whom they took exception remained. That is to say, they have deliberately determined to disobey the instructions of the Executive Council of the whole society, repeated to them by the Local Executive by whom they are directly controlled, which is a serious state of affairs, and betokens that the Executive body of this large and important society has no control over the actions of the men in whose name it acts. The men are receiving "donation benefit" so long as they are off work. This can be granted by their branch, but no other aliment can be given without the sanction of the Executive, they have also made appeals to other union engineers for help, and is said to be meeting with fair success in all the Clyde shops, those on strike profess to think that even without any monetary aid from ordinary "benefit" sources, they will manage to hold out for a while. The Executive Council have refused to sanction any strike pay being given to the men, and it is stated at the London offices of the society, that the strike of engineers on the Clyde is not countenanced at the headquarters of the society, and it is hoped that the men will soon return to work.

The masters are quite at one on the question of supporting Messrs. Dunsmuir & Jackson, and at a meeting of the Employers' Federation, on August 13th, at the County Hall, Carlisle, the Federation requested Messrs. Dunsmuir & Jackson to adhere to their resolution not to discharge the non-union man, and the Federation is subsidising that firm against loss, if any loss is incurred.

A meeting of the Employers' Federation also took place on Monday, August 24th, at Edinburgh, every federated body being represented, Sir Andrew Noble, K.C.B. presided, when the whole situation was discussed, and first a telegram, then a letter embodying the views of the employers were despatched to the representatives of the men in London. The controlling council was asked to give effect to its assurance that the men on strike from the shop of Messrs. Dunsmuir & Jackson would return to work, and in addition the information was conveyed that the Federation was pledged "to preserve freedom of employment both as regards society and non-society men," and on the following day the Clyde Engineering employers met privately in Glasgow to discuss the continued refusal of Messrs. Dunsmuir & Jackson's men at Govan to resume work. It was ascertained that the masters had practically agreed to force the situation by intimating to the men's London executive that if the strike at Govan is not immediately settled a general lock-out of the Clyde, Belfast, and North of England engineers will result. The Belfast and the North of England employers met simultaneously and arrived at a similar decision. This development has caused dismay among the Clyde workmen. Only union men will be locked out, in batches of 25 per cent. The London executive of the employees telegraphed on August 25th forbidding their officials under penalty to assist the strikers. The Clyde masters state that they do not fear the outcome of the struggle, as their organisation was never stronger, not a single firm being outside the association. They consider that the men are not in a good position to assert their demands, and that this fact is recognised by the telegrams from the London executive. They also declare that, although work is plentiful, they will resist to the very end the attempt to interfere with their freedom of employment as regards both union and non-union labour. There are hundreds of non-society men working in the Clyde yards.

The boilermakers employed in Clyde shipbuilding yards have applied for an advance of wages to the extent of 5 per cent. on piecework, and 1s. per week on time rates, and at a joint conference held in Glasgow between the shipbuilders and representatives of the boilermakers and ironworkers, it was understood the masters made an offer which was not accepted, and the conference adjourned indefinitely without a finding.

The riveters employed by Messrs. Caird & Co., shipbuilders, Greenock, have also been on strike, their grievance is the excessive strictness of one of the testers, who, they state, causes them almost double work by chalking bolts which in their opinion are perfectly tight and true, although the society executive declined to take the part of the workmen they refused to return to work for a fortnight, when it was settled, and in the event of any further trouble with the sub-foreman, who is a member of society, he shall be called to a meeting of executive and there dealt with.

Another strike also at Messrs. Caird's & Co.'s was the engineers, who held a meeting to consider the question of the hole-borers being allowed to bore holes for the hawse pipe flange of a vessel building in the yard. The meeting resolved not to return to work till the hole-borers were withdrawn from this work. Mr. George Ferguson waited on the firm, when it was agreed that they should be withdrawn until a conference had been held to determine to which trade the work belonged. The engineers returned to work the same morning.

The ironmoulders employed in the Hyde Park Foundry, Glasgow, struck work on account, it is said, of an alleged breach of shop rules, but restarted after a day's absence on the understanding that the grievance, if possible, would be duly inquired into and remedied.

A settlement has been effected in the dispute at the Clydesdale Ironworks, Mossend, and the work was in full operation on August 17th.

On Saturday, August 15th, the Institution of Junior Engineers, which is holding its summer meeting in Scotland, visited Edinburgh. The members, numbering about 50, had a formal reception in the Council Chambers by representatives of the Corporation. Bailie Gulland presided, in the absence of Lord Provost M'Donald, and welcomed the Institution to Edinburgh.

Messrs. the Dundee Shipbuilders' Co., who have been engaged for the past few months constructing a steel floating dock for use as a graving dock for torpedo boats, the repairing of pontoons of bridges, and as a floating crane, and it measures 152 ft. in length by 43 ft. in breadth, and 16 ft. 3 in. in depth, for the Turkish Government; and Halil Bey, for some time Naval Attaché to the Turkish Embassy in London, visited the city and inspected the same. He expressed his entire satisfaction with the work, and the dock will now be taken down and shipped to Constantinople for erection.

Messrs. the Grangemouth Dockyard Co. have secured an order to build a steel screw steamer to carry petroleum in bulk and general cargo for the Eastern trade. The machinery will be constructed by Messrs. Shanks, Morrice & Co.

Messrs. Scott & Co., Greenock, have secured a government contract to construct the engines and machinery of the first-class twin-screw battleship *Canopus*, now building at Her Majesty's dockyard at Portsmouth. The H.P. of the engines will be 13,500, and there will be 20 water-tube boilers of the Belleville type, at a working pressure of 300 lbs. to the square inch. The contract will occupy about eighteen months in execution.

Messrs. Russell & Co., shipbuilders, Port-Glasgow, have received an order to build a steel twin-screw steamer for cargo and passenger service abroad of 195 ft. keel by 32 ft. beam. They have also contracted to build a steel sailing ship for Messrs. Andrew Weir & Co., Glasgow, to replace the *Gowanbank*.

Messrs. Chambers Brothers, Greenock, have contracted to build, for Major Reginald Turner, Switzerland, a 66ft. steam yacht. She is to be finely fitted up, and is for service in the Mediterranean.

Messrs. David J. Dunlop & Co., Port-Glasgow, have received an order to build a steel screw steam yacht of 200 tons measurement. Triple-expansion engines will also be supplied by them.

Mr. Thomas Orr, junr., boatbuilder, Greenock, has been commissioned to build, for a yacht at present building at Messrs. Scott & Co.'s yard at Greenock, a 32-ft. gig, two cutters, 26 ft. each, an 18 ft. launch, and a Daimler patent petroleum launch.

Messrs. Ramage & Ferguson, Limited, Leith, have received an order for a new steamer from Messrs. J. T. Salvesen & Co., of Grangemouth. They have also contracted to build a first-class composite auxiliary steam yacht of 450 tons for Mr. T. Pim, Martens Grove, Kent, from designs by Messrs. Cox & King, naval architects, London.

Messrs. Murdoch & Murray, shipbuilders, Port-Glasgow, have received an order for a steel screw steamer. Compound surface condensing engines will be supplied by Messrs. Lees, Anderson & Co., Glasgow. She is to be employed on the River Amazon.

Messrs. Blackwood & Gordon, engineers and shipbuilders, Port-Glasgow, have received an order from the City of Dublin Steam Packet Co., of Dublin to build and engine for them a steel screw steamer for the passenger and cattle trade, a duplicate of the steamer *Carlow*, completed by them three months ago. This steamer will be the fifth vessel that Messrs. Blackwood & Gordon will have built for the same company, and she will be employed in the cross-channel trade between Dublin and Liverpool.

Messrs. Ritchtie, Graham & Milne, Whiteinch, have secured orders for the following:—One steam launch, with engines by Campbell & Calderwood, Paisley, and Haythorn's tubulous boiler; and two 25-ton barges for missionary services on the Congo; also one stern-wheel steamer, 140 ft. long, with compound surface condensing engines, and two locomotive boilers by Campbell & Calderwood, Paisley, for foreign owners.

Messrs. Rankin & Blackmore, Greenock, have contracted to supply the engines and machinery for the new steamer being built by Messrs. Russell & Co., Port-Glasgow, for service on the River Hooghly.

A Dutch firm of shipowners has just placed an order for a large passenger steamer with native builders. Offers from the Clyde were from 12 to 15 per cent. higher, notwithstanding the emptiness of many yards in this district.

The Coats Iron and Steel Works, Coatbridge, are to be restarted by Messrs. Paterson, Downs & Jardine. The works are to be remodelled, and machinery of the newest and most modern description introduced. Operations are to be begun at once, and it is expected the works will be in full swing in the course of a couple of months. Mr. William Downs, who was 14½ years commercial manager with Messrs. Lamberton & Co., Sunnyside Engine Works, Coatbridge, will act in a like capacity to the new firm.

TRADE NOTES FROM THE TYNE, WEAR, TEES, HARTLEPOOLS, &c.

(*From our own Correspondent.*)

THE TYNE.

Shipbuilding.—In the department of ordinary mercantile work the contracts in hand by builders in this district are not so numerous as could be wished, but fortunately the presence on the stocks at many of the yards of passenger steamers and other vessels of special types serves to maintain on both sides of the Tyne an appearance of general activity. The lowness of freights and the consequent unprofitableness of shipping as a business continue to exercise a deterrent influence on the investment of capital, it is therefore not surprising that few new orders are heard of. The coming due of the second instalment of the wages advance in September will not tend to improve the situation, for builders' quotations must be further raised, and that kind of alteration is not likely to stimulate the courage of hesitating customers.

The activity at Messrs. Armstrong, Mitchell & Co.'s Elswick yard remains unimpaired, and the probability of additional orders being placed with the company on behalf of the Governments of China and Japan has been greatly strengthened lately. In anticipation of increased pressure on their resources the company are now forming two more building berths at the east side of the yard. To permit of this being done it has been found necessary to dismantle and remove a large saw-mill which occupied the ground. A more extensive saw-mill, to be equipped with plant of greater power, is now being erected in the vicinity of the former site, and it will soon be ready for the cutting and preparation of the huge iron-tipped piles that are to be driven throughout the whole area of the new berths, with the view of making a sufficiently secure foundation. At the company's Low Walker yard the outlook for the immediate future has improved, and it is expected that in addition to the war vessels now on the stocks there will soon be one or two passenger vessels in progress.

In addition to the new work on hand at the establishment of Messrs. C. S. Swan & Hunter an important contract has lately been secured by the firm to overhaul and refit a large vessel belonging to the fleet of the New Zealand Steam Shipping Co. The repairs and alterations to be carried out will be most extensive, practically involving a complete renewal. The fitting up of the interior will be very elaborate, and the labour of joiners, plumbers and decorators will be largely requisitioned. Activity is still the feature at Messrs. Hawthorn, Leslie & Co.'s, Messrs. Wigham Richardson's, and the Palmer Co.'s establishments, the latest announcement respecting the latter being that they are contemplating the starting of a new enterprise which has nothing in common with the industries with which their name has, up to the present, been associated. A large building at the west side of the works which was erected some years ago for the purpose of manufacturing ordnance, but which has since lain derelict, is, it is said, to be utilised for the carrying out of the new venture, and it is satisfactory to know that the premises are admirably suited for the work to be done.

The yard of Messrs. Readhead & Sons is, as usual, well filled with vessels in progress, and others are moored at the quay, receiving their final equipments before proceeding to sea. Work in the initiatory departments is also brisk, and it is rumoured—though we cannot give this as authentic—that a rather important addition has recently been made to the order-book. In the smaller yards business appears to have improved lately, there being, in the aggregate, a larger amount of work on the stocks than was to be noticed a few weeks ago. At most of the graving docks work is fairly active.

Engineering.—Messrs. Hawthorn, Leslie & Co. have been successful in obtaining some further Government contracts of importance, and the briskness which has characterised their St. Peter's Works for many months past is certain to be maintained for a considerable time to come. At the Neptune Works, and also at the North-Eastern and the Palmer Co.'s Works, business continues to be quite active. The Wallsend Slipway and Engineering Co. have secured an important renewal contract in respect of the machinery of the large passenger steamer which Messrs. Swan & Hunter have been commissioned to reconstruct. The company have also obtained the contracts to repair the engines, etc., of two large vessels belonging to Liverpool owners. As many as 200 plates will have to be removed from the shell of one of the vessels referred to. The advent of these contracts has caused a marked change in the state of business throughout the various departments of the works, and it is probable that briskness will now be maintained in the shops throughout the autumn and winter months.

Messrs. R. & J. Dick, of the Greehead Works, Glasgow, manufacturers of patent gutta percha, canvas, and Balata driving belts, have opened a depôt for the North of England at 8, Neville Sreet, Newcastle (opposite the Central Station), under the management of Mr. James Cross, who for many years has represented the firm on the North-East Coast. The firm intend to hold large stocks here, so as to be able to execute orders promptly and satisfactorily. These driving belts are already well and favourably known throughout the North, and there is no reason to doubt that the enterprise of the manufacturers in establishing a branch here for the better accommodation of customers will be duly appreciated by the latter.

Meldrums' Marine Forced Draught.—From the reports of users, it appears that entirely satisfactory results have been obtained by the adoption of Meldrums' system of forced or induced draught. Among the advantages accruing from the employment of regenerative furnaces may be mentioned more complete and ecomomical combustion by which the fuel bill is substantially reduced. Grades of coal which are practically worthless for steam-raising purposes with natural draught may be used with excellent results under Meldrum of properly-arranged assisted draught are demonstrated by increased speed, lessened smoke, and independence of atmospheric pressure and unfavourable winds. When new steamers are fitted smaller boilers may be used, thus leaving a larger amount of space for cargo.

The small waste of steam through the blower is easily made up by slightly increasing the size of the evaporator, an arrangement which does not add so much weight as the necessary engine for fan draught would do. The simplicity of Meldrums' system is perhaps one of its strongest recommendations, and it must also be considered as greatly in its favour that the space taken up is less than is required for any fan draught arrangement. With this system, owing to the absence of moving parts, the liability to derangement or utter breakdown is greatly lessened, and it is also an advantage of no small account that there is no extra machinery for the engine-room staff to look after. In reply to an enquiry as to the quantity of steam required to induce sufficient air for the burning of a stipulated weight of coal under certain certified conditions, Messrs. Meldrum answered: With blowers proportioned for ½ in. air pressure, the diameter of steam nozzle for burning 300 lbs. of fuel per hour would be 3 mm., but in their ordinary practice they allow for ¾ in. pressure as below stated, allowing a margin and proportioning the blowers according, and using two nozzles, each 3 mm. They find that with an ashpit pressure of ½ in. water, one-fifth of a lb. of steam supplies air for burning 1 lb. of coal. With ½ in. air pressure, not more than two ounces of steam per pound of coal should be required.

With regard to evaporative efficiency Messrs. Meldrum guarantee the burning of 40 lbs. of coal per foot of grate per hour. In their own locotype boiler they have burnt from 80 lbs. to 100 lbs. of coal per foot of grate area per hour.

Among the vessels already fitted may be mentioned the steam trawlers *Ayacanora*, *Seagull*, and other vessels belonging to Mr. T. R. Oswald, of Milford Haven. The s.s. *Alacrity* and five other vessels, for Mr. T. Jack, junr., of Cardiff and Larne Harbour, with a seventh vessel on order. The s s. *Mona*, belonging to Mr. J. E. Scott, Corn Exchange, London, and the s.s. *Itanenia*, built by Messrs. Hawthorn, Leslie, & Co., Hebburn, and fitted under the superintendence of Mr. Holt, of Liverpool. The first voyage of this vessel was to South America, and she is now trading from Rio de Janeiro. There has also been fitted for the Tyne Steam Shipping Co. a vessel with the Meldrum furnace, super-heater, and patent continuous regenerator. With this arrangement, coal at 4s. 9d. per ton is now being used, in place of coal at 10s. per ton, which was formerly required.

Messrs. Meldrum have now on hand orders from the Indian General Steam Navigation Co., Messrs. A. and J. Inglis, of Glasgow, and other firms of importance at different centres. It would seem, indeed, that the marine type of the Meldrum forced draught furnace is destined to achieve as marked a success as that already attained by the land type, and more than this need not be said. We may add that the firm have just received an important order (the second) from Messrs. William Wilson & Sons, Glasgow.

THE WEAR.

Shipbuilding.—The only new orders that have been reported as booked on the Wear this month are for turret ships, and the recipients are, as will be surmised, Messrs. Doxford & Sons. Two vessels of superior type and large size (400 ft. long) have been ordered by the "Clan" line of steamers, and these will be fitted by the builders with engines of 3,000 I.H.P., to give a speed of 12 knots an hour. A third vessel ordered by Messrs. Wilson of of Hull, to be of the ordinary turret cargo type, and will have a carrying capacity of 6,000 tons. The system of "Joggle" plating, which was introduced by Messrs. Doxford in the early part of last year, is at length receiving the attention it deserves from others shipbuilding firms besides the patentees. In England the system been adopted by Mr. James Laing, Sunderland, Messrs. Edwards, North Shields, and Messrs. Craggs & Sons, Middlesbro', and on the Continent by the Flensburg Shipbuilding Co. The ball has now been set rolling fairly and we do not doubt that the result will be a very general adoption of the system before many months are past. The first step towards adopting this system is to order a "Doxford's Patent Roller Press," manufactured by Messrs. Francis Berry & Sons, Sowerby Bridge, and all the above named firms have already supplied themselves with one or more of these ingeniously designed machines, the purpose of which is to make the "joggle" or indentation along the landing edges of the outside strakes in plating work. This is done so quickly, that the operation does not cause any diminution in the aggregate quantity, and plates fitted in a given time by a squad of platers. "Joggle" plating has been more than once referred to in former numbers of the MARINE ENGINEER, and our readers will therefore doubtless be aware that the improvement effected by its use lies in the important structural alteration of dispensing with "packing." That is the primary improvement, but there are other advantages obtained, among which may be mentioned an increase of cargo space, a general strengthening of the structure, and added attractiveness of appearance, when a vessel is completed. The fact that Messrs. Edwards, of Shields, have adopted the system, is specially significant, as they may be reckoned good judges of future developments, and are evidently impressed with the belief that in time, all vessels will be plated on the "joggle" system. The circumstance of a foreign firm being so early in the field for the adoption of the system is also suggestive, and ought to put the English builders on their mettle. The keel for an exceptionally large steamer has just been placed at Mr. Laing's yard, and the framing of two others is being proceeded with. One of the latter is understood to be a sister ship to the s.s. *Clydesdale*, a vessel of over 5,000 tons carrying capacity, which has recently had an extensive overhaul on the Wear, and which belongs to a locally managed fleet of steamers. Messrs. Short Brothers have a large amount of work in progress, and at Messrs. Priestman's establishment business continues fairly saisfactory. Only a very few hands are employed at Messrs. Osborne & Graham's, where there is a vessel in an early stage of building; and at Messrs. Pickersgill's yard the whole of the berths are still empty. Messrs. Robert Thompson & Sons have two vessels on the stocks; and at Messrs. Austin's yard the new work in progress consists of a medium-sized vessel, which is nearly ready for launching. The firm are, as usual, well supplied with work in the repairing department.

Messrs. J. L. Thompson & Sons, North Sands, can scarcely be said to be up to its ordinary state of briskness at this moment. There are four vessels on the stocks, but two of them are as yet in somewhat early stages, a circumstance which may account for the temporary lull that seems to exist.

There is but a limited amount of work at Messrs. Blumer's yard just now, and the yards at the South Dock are far from busy. The Wear Commissioners' graving docks are occupied with vessels undergoing repair.

Engineering.—The principal engineering works continue to be well employed, the Palmer's Hill establishment (Messrs. John Dickinson & Sons) being perhaps the busiest. At the Wreath Quay Engine Works (Messrs. Jameson & McCall's) the s.s. *Ocean King*, belonging to London owners, has arrived to have a new crankshaft fitted, and to be otherwise generally overhauled.

The registration of the Sunderland Forge and Engineering Co. Limited, has recently been announced. The capital is £25,000; the object is the development of the Sunderland Forge Co. generally, and the electrical department in particular. The first directors are Mr. Robert Thompson, North Sands Shipbuilding Yard, and Mr. James Marr, the latter of whom will act as managing director. None of the capital of the company will be offered to the public, and it may be added that there have already been secured a considerable number of orders for electrical appliances. It is also understood that the company have orders on their books for steamship lighting installations.

The Hartlepools.—It is just announced that Messrs. Furness, Withy & Co. have received an order for a steamer which will be, with perhaps one exception, the largest ever built at the port. The engines will be supplied by Messrs. T. Richardson & Sons, and will be the largest ever constructed at the Hartlepools. It is also reported that Messrs. Wm. Gray & Co. have received an order for an exceptionally large vessel, the construction of which will be commenced immediately. These orders are exceedingly opportune, as the work in progress at this centre had dwindled down to a somewhat meagre point, and the outlook for the winter had become quite sufficiently depressing.

During the last two months the following steamers, engined by Messrs. Thos. Richardson & Sons, Limited, have proceeded to sea after successful trial trips:—On July 12th the s.s. *Reindeer*, which has been built by Messrs. John Priestman & Co., of Sunderland, for Messrs. Jackson Bros. & Cory, Sunderland, left London for a full-speed trial of her machinery. The engines are 22 in., 23 in., 59 in., by

39 in. stroke, with two large steel boilers working at a pressure of 160 lbs., and the machinery has been constructed under the superintendence of Mr. W. Dumlin, the company's superintendent engineer. On the trial the engines worked in the most satisfactory manner, and the ship afterwards proceeded to Barry to load for the River Plate. On July 25th the first of two passenger and cargo sister ships, which have been built by Sir Rayton Dixon & Co., Middlesbrough, to the order of the Hamburg South American Co., was taken to sea for her official trial. The vessels are 310 ft. long, by 41 ft. 2 in. beam, and 22 ft. 6 in. moulded depth, the carrying capacity being about 4,000 tons. First-class passenger accommodation is provided under the bridge, with a handsome dining-saloon on the bridge-deck. Commodious and well-ventilated quarters for about 300 emigrants are fitted up in the poop and 'tween decks. The machinery, which is of the triple-expansion type, and arranged for a working pressure of 210 lbs. per square inch, has been constructed under the personal superintendence of Mr. Dietz, engineer to the Hamburg-South American Co. The cylinders are 21 in., 33 in., 57 in., by 45 in. stroke, and the engine-room accessories are of the most complete description, including duplex feed donkeys with an automatic feed arrangement, both for the main and donkey boilers, Edmiston's feed water filter, Morison's evaporator, Aspinall's governor, &c. A very convenient arrangement of coal whips is provided, and there is also steam ash hoisting gear for the stokeholds. At the trials, which were of a lengthened description, the whole of the machinery worked in a most satisfactory manner, and Mr. Dietz, who was present, expressed himself highly pleased with the results obtained. The sister ship, the s.s. *Maceio*, was lately returned to the builders' yard, after having her machinery put on board, and she will be ready for sea shortly.

On August 4th the s.s. *Leonis*, with a large company on board, left West Hartlepool for her trials in Hartlepool Bay. This ship, built by Messrs. Furness, Withy & Co., for Captain Blacklin, of West Hartlepool, has been specially designed to carry a large deadweight on a light draught. The engines are 22 in., 35 in., 59 in., by 39 in. stroke, with two large steel boilers working at 160 lbs. pressure, and were built under the inspection of the owner, who was present at the trial trip. After a very successful run, during which everything worked satisfactorily, the ship left for Barry.

On the 10th August the s.s. *Sardonyx*, built by Sir Raylton Dixon & Co., Middlesbro', for Messrs. Hoyland & Co., London, proceeded to sea for her official trial trip. The ship is 322 ft. long, by 40 ft. 6 in. beam, and 28 ft. depth, with a carrying capacity of 4,600 tons. She is built on the deep-frame system, and has five bulkheads, with cellular double bottom for water ballast. The cylinders are 22 in., 36 in., 59 in., by 42 in. stroke, steam being supplied by two large boilers, working at 160 lbs. After adjustment of compasses the engines were run full speed for some time with excellent results, the ship subsequently leaving for Blyth to load for the East. During construction the machinery was under the superintendence of Robert Eeles, Esq., Newcastle.

At the sheerlegs the s.s. *Montgomery*—the third ship recently engined at these works for Messrs. Geo. Horsley & Son, West Hartlepool—has received her machinery and returned to the builders' yard. The vessel is of the well-known turret type, and has been built by Messrs. Doxford & Sons, of Sunderland, as has also been the sister ship *Selma*.

The extensions which Messrs. Richardson have lately been making in their forge department are now completed, and this part of the establishment is in full swing. The new plant comprises a very heavy girder hammer, by Messrs. Davis & Primrose, of Leith, served by two 20-ton steam cranes, by the same firm. Horizontal boilers are arranged over each of the furnaces, in order to utilise the waste gases, and the whole of the plant is of the most efficient type. Messrs. Richardson are now enabled to undertake the heaviest class of forgings, and are very full of this class of work.

Stockton.—Depression is still present in the shipyards, and the outlook for the winter is far from bright. Engineering works are fairly busy, and steel works are well supplied with orders.

Middlesbro'.—With the removal to new premises Messrs. Craggs & Son appear to have added considerably to their work engagements. There are at all events seven steamers now on the stocks, two of which are of rather large dimensions. Steel works at this centre continue to be briskly employed.

Consett.—The prosperous condition of the Consett Iron Co.'s works remains unchanged, and the weekly output of plates, angles, &c., is as large as ever.

THE MERSEY.

(From our own Correspondent.)

NO material change is noticeable in the position generally as regards the shipbuilding, marine and general engineering industries of this district. Establishments, as a rule, have sufficient work in hand to carry them several months forward, whilst new orders of considerable weight are being booked. In the iron trade, however, the position is scarcely so satisfactory, the demand having slackened off considerably, and although generally a steady tone is maintained, prices, in some cases, have given way, whilst a disturbing element in the market has been the threatened competition of American pig iron, which, subject to favourable freights being obtained, has been offering here at prices which would certainly cut out some of the district brands.

Messrs. Laird Bros., of Birkenhead, continue well employed on work in hand, with which they are making rapid progress, and it is expected that the second of the Irish mail boats will be launched during the present month. The firm have also secured an order for a new battleship, *Glory*, so that they have plenty of work to keep them busily engaged for a considerable time ahead. During the month the torpedo boat *Thrasher* has undergone a trial in Liverpool Bay, under Admiralty conditions of load and displacement. The mean speed over the whole trial was 30·38 knots, with an improvement on the last two runs to 30·84 knots, or nearly 36 miles an hour. The *Banshee*, *Ferret* and *Lynx*, built by Messrs. Laird in 1893-4, are to be sent to foreign stations, and will join the Mediterranean fleet under Sir M. Culme Seymour.

With regard to the engineering trades, the annual holidays during the past month in the Lancashire industrial centres have, of course, put a temporary stop to operations, but the position generally continues very satisfactory; all branches have plenty of work in hand, orders of considerable weight having been booked recently. This activity in trade has necessarily brought the wages question to the front, and at several of the local shops the employers have yielded to demands for higher wages, whilst other disputes are still pending with little probability of settlement until after the holidays. At Bolton, where the workmen demanded an advance of 2s. per week, to commence in September, the employers have promised to practically concede the advance, but only to come into force in November. The workmen's officials advise the acceptance of these terms, and, at the time of writing, there is every probability of a settlement, the final decision of the men, however, being delayed owing to the annual holidays at the Bolton engineering shops. A circular has also been sent out by the trades' union societies to the employers in the Manchester district, requesting a similar advance to that demanded at Bolton. In this circular, which is issued by the Amalgamated Society of Engineers, the steam Engine Makers' Society, and other engineering trades' unions. The workmen, in making their request for 2s. per week advance, state that they need not draw the employers' attention to the present prosperous condition of the engineering trade further than to bring under their notice the fact that the workmen engaged in the above industry have not troubled the employers for the last twenty years, by making any overtures for a general advance in wages, and are now of opinion, taking into account that skilled workers in other trades have been making rapid strides in the way of bettering their position from a wage-earning point of view, whilst they (the engineers) have played a passive part, that as workmen engaged in one of the most skilled trades, they are fully justified in approaching the employers on this important matter. An answer to this circular by the 8th September will, it is added, be esteemed a favour. Some of the leading employers in the Manchester district have expressed themselves strongly to the effect that in view of the fact that no reduction was made during the long period of depression, the men are not justified in asking for an advance on the first indications of improvement. The men, however, contend that they have a perfect right to ask for the advance, their position being that the Manchester district, instead of taking the lead as regards wages in the provinces, is now getting behind the basis in Sheffield, for instance, being 35s. and 36s., as compared with 32s. and 34s. in Manchester, whilst in the smaller engineering centres of Lancashire, which were previously 2s. below the basis of Manchester wages have now been generally got up to something like the Manchester level.

The employment returns of the principal engineering trades unions issued during the month show no material alteration in the number of out-of-work members which continues exceptionally low. The Amalgamated Engineers have not more than 2⅓ per. cent of the total membership on support, whilst in the Manchester district the proportion continues at the low rate of 1⅔ per cent. of the total membership, with an active demand for skilled workmen. The Steam Engine Makers' Society reports ⅔ per cent. on donation, which is practically the same as last month. Reports on the condition of Trade continue remarkably favourable, there being scarcely room for further improvement in most branches so far as work in hand is concerned.

Messrs. Vaughan & Son, West Gorton, Manchester, have amongst other additions to their machinery and works, opened a new erecting shop, 200 ft. long by 50 ft. wide, in which they have installed a 20-ton electric travelling crane, of their latest design, and of which a short description will no doubt be interesting to our readers. A separate reversible motor is employed for each of the three motions of longitudinal travel, cross travel, and hoisting, and the motors for cross travel and hoisting which are very compactly fitted to the crab, drive directly on to the spur wheel shafts without the intervention of any friction or worm gearing. All the motions are perfectly under the control of the attendant. by means of reversing switches, and can be carried on simultaneously in either direction, or separately, as desired. The longitudinal travel is arranged to vary from zero to 250 ft. per minute, maximum, this high rate of speed being secured with perfect smoothness and safety by means of a reversible motor fixed upon the end of the girders driving one of the main carriage wheels at each end, a steel cross-shaft passing from end to end of the girder and spur-gearing. The value of such a rate of safe working will be apparent to everyone who has experienced the loss of time in a busy shop caused by men having to wait for cranes. Messrs. Vaughan are at present busily engaged on a number of special orders for their well-known types of travelling cranes, including a 15-ton three-motor crane for Messrs. Neilson & Co., Limited, Glasgow, to be fixed in new shops which they are erecting.

A very novel and ingenious automatic lamp-extinguisher, specially adapted for adoption on board vessels where duplex oil lamps are in use, has been patented by Messrs. H. & G. O. Lewtas, of Manchester. In this arrangement by which the light is immediately put out if the lamp should happen to overturn, a double lever is pivotted loosely to the casing surrounding the burner. One end of the lever engages with a pin on the extinguisher, and below it is placed a spring, which is kept in place by prolonging the other end of the lever past the pivot, and supporting it against the pressure of the spring by an upright strut, weighted at the lower end and hung in a ball socket, which is supported by an extension from the side of the casing. The upper end of the strut is reduced to a point, which comes beneath the small flat end of the spring lever extension. So long as the lamp is handled with ordinary care, or standing undisturbed, the appliance remains in position, and the extinguisher does not act, but should the lamp be knocked over or roughly handled the strut will swing on its socket so as to move the pivot from beneath the end of the spring lever, whereupon the spring acts, and the lamp is extinguished. To extinguish the light in the ordinary course, all that is necessary is to slightly move the strut, when the extinguisher lever will come into operation. The lamp cannot be lit until the extinguisher has been set in position, so that there is no danger of fire owing to carelessness in this respect. We have made a number of tests with the appliance, with very favourable results, and as the apparatus can be applied to existing duplex oil lamps, it should command a ready sale.

Messrs. Luke & Spencer, Broadheath, near Manchester, are bringing out a number of specially-designed automatic saw-sharpening machines, constructed on the Schwaltz patent, in which emery wheels are used for the operation of sharpening, files being entirely dispensed with. One of the leading types is a machine for sharpening circular or band saws, having small straight teeth for wood-cutting. In this machine the emery wheel is mounted on a spindle carried in a rising and falling head, and arranged so that the teeth of the saw can be ground at any angle required, the head being raised or lowered by means of a cam, and the saw is fed forward during grinding by a pawl arrangement operated by another cam. The machine is adjustable to grind teeth ranging from ¼ to ¾ in-pitch, and when operating on a circular saw, will sharpen 80 to 100 teeth per minute. For grinding band saws a similar machine is used, the saws being carried round girder pulleys, and, by the addition of another counter-shaft the machine can be adapted for sharpening saws having a long pitch, such as are used on American band-saw machines. Another type of machine for sharpening either frame or circular saws, has also been designed, in which the emery wheel is carried on a rising and falling head, which is arranged to swivel, and give the required angle and bevel to the teeth of the saw. The motions of the wheel are operated by three cams, one raising and lowering, the second giving the swivelling motion, and the third working the ratchet pawl, which automatically moves the teeth under the wheel to be operated upon. All the necessary adjustments can be made in these machines during the operation, and the requisite shape and bevel on the upper and front edge of each tooth is secured with mathematical accuracy, leaving all the teeth exactly parallel and radial with each other. Special attention has been paid to minimise the wearing out of working parts, tooth gearing having been totally avoided, and substituted by hardened steel eccentrics, working automatically in contact with steel rollers. With one of these machines an attendant can sharpen fifteen frame saws, and a proportionate number of band or circular saws per hour, whilst the cost of emery wheels is much less than that of files in the older and much slower methods. An exhaust fan with air pipes and dust-guard can be supplied, if necessary, to prevent dust from flying about in the workshop whilst the machine is at work. In addition to the machines for operating upon wood saws above described, we understand that designs are also being brought out for sharpening metal saws.

In the iron trade business has quietened down considerably during the past month, and there has been a downward move in prices for some of the foundry brands of pig iron—which, however has shown some recovery with the close of the month—with a good deal of underselling by merchants, but makers generally are firm at list rates, and the tone, on the whole, continues healthy. In local and district brands, Lincolnshire foundry has been reduced 1s. per ton, 42s. net cash being now the average quotation, but foundry Lancashire remains steady at 46s. 6d. less 2½, with Derbyshire 45s. to 47s. net cash, delivered Manchester; forge descriptions average 44s. less 2½ for Lancashire, and 42s. 2d. net cash for Lincolnshire, delivered Warrington. Outside brands offering here have shown a weakening tendency, and merchants, in many cases, have been selling at very low figures, with makers not in so strong a position as they were. For Middlesbrough merchants would be prepared to sell as low as 45s. 3d., although makers do not quote under 45s. 10d. to 46s. 4d. net cash, delivered by rail Manchester, whilst Eglinton could be bought through merchants at 46s. to 46s. 6d., and Glengarnock 46s. 6d. to 46s. 9d. net prompt cash delivered Lancashire ports, with makers asking 6d. per ton above these figures.

The shipment of American pig-iron to this country through Liverpool and the Manchester Ship Canal, would seem to be now becoming a possibility. During the past month active negotiations have been in progress with a view of exporting American foundry pig-iron to this district in considerable quantities, and offers made have been based on prices which compete keenly with similar English brands, whilst a representative of one of the largest iron-producing companies in Alabama has been attending on the Manchester Exchange with a view of opening up direct business with Manchester through the Ship Canal. One offer, which is under consideration subject to favourable freights being obtained, is at 38s. per ton, delivered Liverpool. The condition which renders this shipment of American pig-iron possible is the necessity of ballast cargoes in the cotton-laden ships coming to Liverpool and up the Ship Canal, the iron which has hitherto come over having been at ballast rates. representing 6s. per ton from Mobille, whilst even 4s. is talked of. If these special rates can be arranged, American makers are preparing to ship over here, not only surplus stocks of iron which they are anxious to dispose of at under cost price, but iron which they will make and deliver in the regular way of trade; and it may be taken for granted that as Mr. Marshall Stevens, who has during the past month started on a visit to the States, has selected the iron-manufacturing districts of Alabama as one point of call, one object of his tour will be the arrangement of such special facilities as are required with a view of promoting the shipment of American pig iron direct to Manchester through the Ship Canal. This threatened competition of American iron could scarcely be met by any material reduction in the price of English brands, and the only alternative would be some concession by the railway companies in the charges for carriage. Negotiations are already in progress for a reduction of 1s. per ton on the rates for Middlesbrough, which now costs 8s. 4d. per ton to carry to Manchester, whilst district makers, whose iron costs almost as much to carry to Manchester as American pig-iron does from Mobille, would no doubt claim some concession. In well-informed quarters, the successful competition of American iron is however regarded as too much dependent upon temporary and special conditions to assume any permanent footing in this country, but there still remains the fact that negotiations for a considerable weight of business are in progress, and the present position undoubtedly creates a disturbing outlook in the iron trade of the district.

Finished-iron makers have been securing a fair weight of new orders, and are kept well engaged on work in hand, but have not been able to obtain any appreciably better prices, except an advance of 2s. 6d. per ton for shipment, £5 12s. 6d. being now the minimum for Lancashire bars f.o.b., Manchester Ship Canal or Liverpool, with inland rates varying, according to delivery, from £5 10s. to £5 12s. 6d., and North Staffordshire £5 12s 6d. to £5 15s.; sheets, £7 5s. to £7 10s.; hoops, £6 2s. 6d. for random to £6 7s. 6d. for special-cut lengths, delivered Manchester district, and 2s. 6d. less for shipment.

The position in the steel trade is not at all satisfactory. For hematites makers have eased down to 57s. and 57s. 6d. less 2½, with merchants lower sellers; local-made billets do not average more than £4 7s. 6d. net cash, with competition threatening from American billets; bars are obtainable at £6, and boiler plates, notwithstanding the activity amongst users, have been offered at lower figures, £6 2s. 6d. to £6 5s. being the average, delivered Manchester district.

A brisk business is reported in the metal market, and brass and copper wire, rolled brass and brass tubes, have been advanced ¼d. to ½d. per lb., with a re-arrangement of extras on brass and copper wire, delivered Manchester district; list rates are now as under:—Rolled brass, 6d.; brass wire, 6¼d. to 6½d.; copper wire, 7½d. to 7¾d.; brazed brass tubes, 7¾d. per lb.

In the timber trade, increased activity is noticeable as regards most departments. Imports have been large, but deliveries have been good, and prices firm at late rates. Stocks are only moderate, and, with reasonable shipments, prospects continue fair. In teak logs and planks the market is steady, and most of the consignments have moved off readily. Only one cargo of greenheart has arrived, stocks are moderate and prices firm.

The coal trade has altogether lost the temporary improvement caused by the increased pressure of demand brought about by anticipations of a wages strike, and pits generally have had to go on to three and four days per week, whilst prices have again got back at the low rates ruling prior to the collapse of the Conciliation Board. The usual annual holidays in the chief Lancashire industrial centres have also considerably curtailed requirements both for domestic and manufacturing classes of fuel. House coals are in but slow demand, whilst steam and forge coals move away very slowly, with prices averaging 9s. 6d. to 10s. for best Wigan Arley; 8s. to 8s. 6d. for Pemberton four-feet and seconds Arley; 6s. 6d. to 7s. for common housecoal, and 5s. 6d. to 6s. for steam and forge coals at the pit's mouth. Engine fuel is more plentiful, owing partly to the lessened manufacturing requirements, and partly to increased supplies coming in from Yorkshire; common slack does not average above 3s. to 3s. 6d., and best sorts 4s. 3d. to 4s. 9d. at the pit.

The shipping trade is very quiet, with lower prices ruling, 6s. 9d. to 7s. 3d. being now the average for ordinary steam coals, delivered Mersey ports.

McDougall's Patent Mechanical Stoker, of which Messrs. W. B. Haigh & Co., Limited, of Plane Street, Oldham, are the sole manufacturers, has been selected by the London County Council for a large installation of boilers for Crosness Pumping Station.

BELFAST TRADE NOTES.

(*From our own Correspondent.*)

A SEVERE check has been given to the engineering and shipbuilding trades here by the disastrous fire which happened between Sunday night and Monday morning, the 26th and the 27th July. The fire, originating in the joiner shop of Messrs. Harland & Wolff, spread with such alarming rapidity that in about two hours the fine engine works of Messrs. Workman, Clark & Co. were completely destroyed, together with a large part of the same firm's South Yard. The total damage caused by the fire included Messrs. Harland & Wolff's joiner shop, cabinet-making department, and masting shed, also Messrs. Workman, Clark & Co.'s fitting, turning, erecting, pattern and smith shops, with the total destruction of all their large stock of engine patterns. The offices of the South Yard, belonging to the same firm, and a large amount of valuable timber, with several other buildings, were totally destroyed. Fortunately the engine works offices, being built of brick, withstood the fiery ordeal, being only slightly damaged with water. The shipyard offices of Messrs. Harland & Wolff had an extremely narrow escape, being only saved by the presence of a thick brick wall built at the end of the joiner shop. The cause of such a rapid destruction of property will be better understood when it is stated that the framework and roofs of all the buildings in question were of wood, only the higher spans being supported by cast-iron columns. In the course of the fire, a large part of the splendid furniture and fittings for the "P. & O." passenger steamer *China*, was destroyed, along with that for the s.s. *Comic*, and other steamers.

The calamity is all the more to be regretted, as most of the buildings destroyed were only from two to four years old, and contained machinery of the most up-to-date kind. A gratifying feature, however, has been the resource and determination with which the disaster has been met by both firms, Messrs. Harland & Wolff having already partially erected new sheds of the same description, indeed, it is affirmed as a fact that before six o'clock on the Monday on which the fire occurred, orders for the whole of the material, including roofs of the Belfast type, and new machinery, had been placed. Messrs. Workman, Clark & Co. have been little less active, but owing to the more extensive and varied character of their loss, the work of rebuilding has not proceeded quite so rapidly. Their intention is to replace the wooden building with one entirely of iron.

At the time the fire happened Messrs. Workman, Clark & Co. had a large set of engines almost completed and ready to go into the steamer they are building for Messrs. T. & J. Harrison, of Liverpool. They had also one of the two sets of engines for the Japanese boat well in hand. These engines they have re-let to Barclay, Curle & Co., Glasgow. Several of the other engines will also be given out to other builders.

The fire has seriously interfered with the tonnage production of the firm for the year, but in spite of the strike of the beginning of the year, and the disaster now, Mr. Pirrie, of Harland & Wolff's, stated at a public meeting that his firm hoped to launch something like 94,000 tons for this year. This, if accomplished, should prove a total hard to beat.

A repeat order has been placed with Messrs. Workman, Clark & Co., Limited, for another steamer of the same dimensions as the one now in hands for the Nippon Yusen Kaisha.

During the month the Belfast Harbour Commissioners have also placed an order for a steel twin-screw tug-boat with the local firm of Messrs. McColl & Co., Limited. The necessity for this vessel has long been apparent, tenders having been asked from various firms over twelve months ago, but from various causes the placing of the contract has been deferred till now. The steamer will be fitted up as a fire and salvage float, and will be a welcome addition to the appliances of this port, dispensing with the necessity of bringing over a Liverpool tug when any of the large steamers built here require towage services.

The s.s. *Antenor*, for Messrs. A. Holt & Co., Liverpool, underwent her trial trips during the month, and proceeded to Glasgow. The vessel is a sister ship to the s.s. *Patroclus* recently dispatched.

The s.s. *Denton Grange*, for Messrs. Houlder Bros., of London, will also leave here during the month. This fine vessel is similar to the s.s. *Langton Grange* recently described, and will also be employed in the frozen meat trade between London and New Zealand.

The Dominion Line steamer *Canada* is now well on her way towards completion at the hands of her builders, Messrs. Harland & Wolff, Limited, who are also at present putting on board the machinery of the P. & O. steamer *China*. This still leaves two boats in the basin to be similarly treated, viz., the *Comic* and *European*.

No vessels have been launched during August by either firm.

The annual summer meeting of the Institution of Mechanical Engineers commenced here on Tuesday, 28th of July, and was concluded on Friday of that week. This is the first time that the Institution has paid a special and separate visit to Belfast, and therefore it is all the more to be regretted that the fire in the shipyards should have marred to some extent the pleasurable recollections of this year's gathering. Both shipbuilding establishments were to be inspected, but on account of the fire Messrs. Workman, Clark & Co., Limited, had most reluctantly to cancel the invitation, and the total destruction of the fine machinery in the wood-working department of the other firm deprived the visitors of another interesting sight. Otherwise the meeting was most successful, and great interest was taken in the reading and discussion of the various papers read before the Institution, and in the public works thrown open for their inspection. During their stay the members were hospitably entertained by the Lord Mayor and Mrs. Pirrie, and other prominent citizens.

NORTH-WEST OF ENGLAND.

(From our own Correspondent.

Barrow.—Regret has been very generally locally expressed at the failure of the Barrow Co. to secure an order from the Government for one of the two battleships placed out with private builders by the Admiralty this month. A big bid was made for this work not only by Barrow but other builders, and it is known that the local firm was not far above the price offered by the successful firms. It is generally understood here that the Thames Iron Co. made a bold effort to regain its position as a builder of battleships for the Navy, especially after so many failures to secure orders against the cheaper prices offered by Scotch and North of England builders. It is clear, however, that the price put in by the Thames Iron Co. for the hull of the battleship is about a right one, on the basis of the wages paid in the North of England and Scotland, and that they have been helped in securing the order by the very cheap price at which London engineers have tendered for the engines. This price is something like £20,000 below the price given by every builder who has had experience in the construction of the Belleville boiler with which these ships will be fitted. Herein lies the secret of the success of the Thames Co. and of Laird's. The latter firm of course has had much experience in the building of line-of-battle-ships, but up to now has had no work to do in the building of the Belleville type of boiler. The experience of other engineers in this work has been very dearly bought, and hence the higher price quoted in new tenders for boilers of this description. It is gratifying to know that the Belleville boilers placed in H.M.S. *Powerful* by the Barrow Co. have given entire satisfaction, but it yet remains to see how these boilers will work when at full speed for long trials. Our correspondent, who has had the opportunity of watching the stoking of these boilers for a considerable time, and of noting their wonderfully quick steam-producing power, is sanguine that not only can the boilers maintain plenty of steam for continuous running so long as the coal supply lasts, but that they exist in the *Powerful* to so large a number as to give opportunity for keeping several out of steam even when full speeds are required, and thus affording opportunity for systematic inspection and repairs to any boilers needing attention. There cannot be a question that the Admiralty has taken the right step in adopting the Belleville boilers for fast cruisers, as also for line-of-battle ships. Steam can be rapidly got up, if say only one or two boilers are constantly kept alight so as to keep the engines warm, and it is estimated that in half an hour a ship fitted with these generators would be able to exert her full steam power and strength. The *Niobe* class of first-class cruisers are being fitted with the Belleville boiler, and it is reasonable to believe that the Admiralty will find it expedient and wise to adopt this generator in all large craft and other types of water-tube boilers in smaller craft. Much, however, depends on the success of the steam trials of the *Powerful* and the *Terrible*. The trials of the latter having been deferred owing to some defects in the engine-room, those of the *Powerful* have been fixed for September 18th. Much reason for complaint has arisen because of the way in which the *Powerful* has been kept back from her speed trials, although practically ready to undertake them when she left Barrow, providing her hull had been sheathed. It is admitted that the *Powerful* was much more forward as a finished ship than the *Terrible*, but the latter cruiser was successful in first getting the navigating party, and the *Powerful* has been kept back ever since, but the accident to the *Terrible* has altered circumstances, and the *Powerful* will now step to the front. Our correspondent, who has spent much time in the engine-room of the *Powerful* when the engines have been working, speaks highly of them in every sense. The arrangement is very satisfactory, and although there is not too much room for the engineers, with machinery of all sorts on every side, there is evidence all round of a good and well-finished job which has been admirably designed and splendidly carried out. Mr. Edwards, the staff engineer of the *Powerful*, is highly pleased with the engines, which he has seen built up from their foundation, and if the trials are as satisfactory as they seem likely to be, the Barrow Co. will deserve credit. The Naval Construction and Armaments Co. is one of the twelve firms to have been asked to tender for the building of three first-class cruisers of the *Niobe* type for the Admiralty. Three firms are already busy at the work of building three of this type of cruiser, and will therefore, by the experience gained, be well able to tender for the new work. There is plenty of room in the Barrow yard for further orders of this sort, and it is hoped that the Barrow Co. will, at any rate, secure one of these ships to build. The launch of the *Clan Sutherland*, building for the Clan Line, Limited, is fixed for September 26th. The Barrow Co. has on the stocks, in addition to the *Niobe* and the Clan liner, four torpedo-boat destroyers, two of which are ready for launching; a Barrow and Belfast steamer to steam 19 knots; and two Great Western Railway Co.'s steamers for the Channel Islands service, to steam 20 knots. It is hoped that other commercial orders will soon be secured, as the yard is beginning to look very bare. Much activity is shown on the engineering side of the works at Barrow, and the orders in hand are being proceeded with very satisfactorily. In addition to the engines and boilers for the *Niobe*, the four torpedo boats, *Avon*, *Bittern*, *Otter*, and *Leopard*, and for the *Duchess of Devonshire* and the two Great Western boats, the Barrow Co. has a tripling job on hand, that of the *Clan Sinclair*, which is now on her way from the East Indies to Barrow. Other tripling jobs are expected for the same owners and from other firms, the fact being more and more understood now-a-days that old steamers must either be fitted with modern engines or broken up to make way for more economic types of ships. H.M.S. *Juno*, second-class cruiser, left Barrow for her preliminary trials on Saturday, August 22nd, and after adjusting compasses, proceeded to Devonport, where she arrived at mid-day on Sunday, after a very successful run. Under easy steam she made 15 knots, with 120 revolutions of the engines. Her sister ship, the *Doris*, will be completed and ready for delivery to the Admiralty in about six weeks time. The first-class cruiser *Niobe* will be launched at the close of the present year.

West Cumberland.—There is much activity and steadiness in the shipbuilding trade of West Cumberland, and the two yards there are well off for orders, with every chance of new work so soon as they are in a position to take it. The class of ship built is generally of small tonnage, but it is of a type in large demand, and for the economic production of which West Cumberland is well adapted.

Li Hung Chang.—Some significance attaches to the fact that Barrow-in-Furness was the first place visited by Li Hung Chang, the Chinese Envoy, after leaving London. He was much interested in the operations in steel manufacture he saw at the great Barrow Steel Works, and especially so as regards steel rails and steel shipbuilding material. He afterwards visited the works of the Naval Construction and Armaments Co., where he saw all the work in progress for the British Admiralty, together with the commercial tonnage building. He was deeply interested in the engineering department, and in the two second-class cruisers, *Juno* and *Doris*. Importance attaches to the visit of the Chinese envoy to Barrow by reason of the fact that China intends to develop a big railway system and create a new navy. In both respects these advances on the part of China will furnish employment for the trades carried on at Barrow, steel making and shipbuilding, and if Li Hung Chang gets back to power, as there seems reason to believe he will, Barrow and the other places visited by His Excellency may expect to benefit by the orders which an enlightened policy of national development will bring about.

Shipbuilding Material.—The demand for all descriptions of shipbuilding material is steadily maintained, and local works are well off for orders, and likely to remain busy for some time. The Barrow Steel Works are admirably situated for cheap delivery of goods to the Barrow, Liverpool, Belfast and Clyde yards, and it is from these quarters the demand now experienced chiefly comes. Prices are well maintained, and there is a large output of heavy and light plates and of heavy steel castings.

The Hematite Trade.—There is marked steadiness in the hematite pig-iron trade, and orders are still coming in freely as well from local as from general sources. Makers are busy and well sold forward, and keep up their prices at 48s. to 49s. for mixed Bessemer nos. net f.o.b. Warrant iron has been weak during the month, but towards the end prices were firmer at 46s. 9d. net cash sellers. Only 37 furnaces are in blast, but stocks have gone down fully 3,000 tons.

Shipping.—The shipping trade is busily employed, and the exports of pig-iron and steel are well maintained. They show marked increases over the tonnage shipped in the previous year, but shippers generally complain that freights are too low to yield a profi

Reviews.

Bulletin de l'Association Technique Maritime. Vol. 6. Session de 1895. Paris: Gauthier Villars et fils. 1896.

THE sixth volume of the Proceedings of the Institution which corresponds on the other side of the Channel to our Institute of Naval Architects contains much to interest our readers. The list of members contains the names of many of the most famous naval architects and journalists we have. The rules of the society are also given, with the alterations made at the beginning of last year. In his summary of the work of the year the President notices that 1895 was remarkable from the fact that France and America had each given their adhesion to the triple-screw principle. England, he said, had also returned, owing to the increased power of explosives to a complete system of armouring its vessels, and also to very large tonnages, both in battleships and cruisers. This last after some waverings. For, as to first-class cruisers, after building the *Blake* and the *Blenheim*, we had gone back to the *Edgar* class, springing forward again in the *Powerful* and *Terrible*. Herein he is technically accurate, yet in point of fact his deductions are subject to a certain qualification. The *Blake*, the *Edgar*, and the *Powerful* are truly all classed as first-class cruisers. Their respective dimensions and order of construction are as he states, yet there is still something to be said. The *Edgar* was a first-class cruiser of the ordinary type of 1889. The first-class cruiser of the type of 1896 is still larger than she is. But she is nevertheless smaller than the *Powerful*. The fact is the *Blake* and her sister were a sort of "extra first-class cruiser," built for a special purpose, viz., as Britain's answer to the Russian *Rurik*. Then followed improved *Rurik's*, and our counter move was not the building of the *Edgar*, nor of the improved *Edgar's* of the present year, but the construction of the improved *Blenheim's*, which as *Powerful* and *Terrible*, are now completing for sea. Again, at the close of his survey, the President speaks of the fact that "great tonnages in the Mercantile Marine do not seem to have had happy results from an economical point of view," and cites "the dearly-bought experience of the *Lucania* and *Campania*." It is true that the American Line, with its *S. Paul* and *S. Louis*, fell back to the dimensions of the *New York* and the *Teutonic*, rather than attempt the size of the *Lucania*. Yet it must be remembered that the *S. Louis* was the first attempt of the American yard at building a fast Atlantic steamer. They were well advised not to attempt the first flight. The Cramp-built vessels were exceptional for this reason, and can hardly be cited as marking the general practice of all nations. Especially may we say this when we remember that the Germans are now pressing forward the construction of two vessels which will both surpass the dimensions of the great Cunarders. Besides, the President's remark applies solely to mail steamers, which are only one department (and that a small one, though one much discussed) of the Merchant Marine. The great bulk of the merchant tonnage of the world is in cargo steamers, and with them we see size constantly and largely increasing. The *Cevic* and the *Samoa* are eclipsed by the *Georgic*, and her place will soon be surpassed by the great *Pennsylvania*. The limit of size in merchant steamers does not yet seem to have been reached.

The body of the book contains some most interesting and valuable papers. The problem of speed is considered by no less an authority than M. Normand, the builder of the *Forban*, the present fastest vessel afloat, and of many other vessels of the same type. He believes that the solution of the problem of speed will in the future be assisted by the use of liquid fuel.

M. Croneau discusses the complications introduced into modern vessels of war, and makes a comparison between the comparative simplicity of the French warships *Redoubtable* of 1874, and the complexity of her successor, the *Massena* of 1894. He would reduce the use of steam to the work of driving the ship, and use electricity for all other purposes where mechanism is required. M. Piaud, the chief engineer of the Bureau Veritas, gives a paper on a new type of shallow draught river steamer.

The lessons of the battle of the Yaloo River are thoughtfully worked out by M. C. Ferraud. He says the true battleship must be a high freeboard monster completely armoured, and carrying both heavy guns and quick-firers. Speed would here be sacrificed, but the vessel would go where she liked in the presence of the enemy. An interesting paper on Ice-breakers is contributed by M. M. Dibos. This leaves a field not much explored by British engineers and naval architects, whilst M. Victor Guilloux gives a paper on the important question of the use of aluminium in naval construction. He believes that at the present at least it is only the builders of little boats who can hope to profit by its use. He gives hints as to the selection of alloy, and as to the preservation of the fabric from the effects of the sea water.

The whole series of papers can be commended to our readers as thoughful and most instructive.

The X Rays. By Arthur Thornton, M.A. London: Percy Lund & Co., Limited, 1896.

THIS, the tenth volume of the Popular Photographic Series, deals in a popular but most instructive fashion with the discoveries recently made in what should properly be called the science of Radiography. Beginning with well-known facts relating to the effects of vibration on human senses, he points out how it has long been known that, though the eye and ear of human beings are affected respectively by vibrations of varying frequency, that there are beyond and between many ranges of vibration which our sense of hearing and sight are not adapted to catch. What Professor Röntgen has done has been to enable the photographic negative to translate that which is seen by the X rays into pictures which human senses can appreciate. The position is very clearly indicated by Mr. Thornton's observation that had our eyes been adapted for observation by Röntgen rays, we should have made our windows of ebonite plates instead of plate glass. Readers will see the force of the remark emphasised by one of the radiographs reproduced in the book itself. Here the contents of a closed wooden box are revealed by the X rays; and whilst wood and wax are so transparent as to be hardly indicated even by shadow, a small piece of flint glass appears almost as opaque as a watch-key which lies beside it. In taking this picture, a thin ebonite plate acted in the place of the lens of the camera. The discoveries in connection with this subject have, of course, scarcely commenced. It was only in December, 1895, that the general public heard of the X rays at all. It is only fair, therefore, to presume that progress will be made in the adaptation of the new knowledge to the arts. So far, surgery seems to have had the chief benefit of what is known. But it is believed that the engineer may reap the benefit also, and that the presence of flaws in heavy and important forgings will be discernible by its means. It is therefore a matter of considerable interest to our readers, and for those who desire an intelligent and interesting account of how matters stand to-day in regard to this remarkable discovery we can confidently recommend this little work.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Rookwood.—On July 24th there was launched at Messrs. John Blumer & Co.'s, at Sunderland, the steel screw steamer *Rookwood*, built to the order of Mr. H. Cecil Polly, of London. The vessel is to take the highest class at Lloyd's, and is of the following dimensions:—Length, 236 ft.; breadth, 32 ft.; depth, 18 ft. 3 in. The engines and boilers are being constructed by Messrs. John Dickinson & Sons, Limited, having cylinders 19 in., 31½ in., and 51½ in., with a stroke of 36 in. The boilers are of steel, and have a working pressure of 160 lbs. per square inch.

Corcovado.—On July 25th, from the East yard of Messrs. C. S. Swan & Hunter, Limited, was launched a large and finely modelled screw steamer for the Pacific Steam Navigation Co., for their Home and Pacific Line. She was gracefully named the *Corcovado* by Mrs. Alexander, the wife of the company's resident inspector. The *Corcovado* is the largest cargo steamer in the company's fine fleet of vessels. Her length is 405 ft.; 47 ft. 3 in. beam; and 32 ft. 9 in. deep; her deadweight will be about 6,500 tons; she will be fitted to the owners' highest standard in all respects, the cargo and mooring arrangements receiving special attention, and nothing has been spared to ensure success in every department. She has nine special steam winches, also 11 cargo derricks and spans for quick dispatch. Three steel decks, the upper one being partially sheathed with teak, Hall's stockless anchors, Harrison's steam steering engine. She is fitted with seven watertight bulkheads, and a cellular double bottom all fore-and-aft, divided longitudinally into ten compartments. Triple-expansion engines are being constructed by the Wallsend Slipway and Engineering Co.; cylinders 24 in., 40 in., 66 in., by 51 in. stroke, with three large boilers, all adapted for a working pressure of 190 lbs. per square inch. Independent centrifugal circulating pump, Weir's feed pumps, steel shafting throughout, bronze propeller blades, and all other details of the highest class will be supplied. The work has been rapidly executed under the able direction of Captain Conlan and Mr. James Thomson, the company's marine and engineering superintendents. We are pleased to add that Messrs. C. S. Swan & Hunter, Limited, have also been favoured with a duplicate order from the Pacific Steam Navigation Co., which will be immediately proceeded with. It is also of interest to note that the *Corcovado* is the first steamer ordered by this old established company from east coast builders.

Falcon.—On Monday, July 27th, there was launched from the yard of the Sunderland Shipbuilding Co., Limited, a steel screw steamer, 152 ft. between perpendiculars, 25 ft. 6 in. broad, by 12 ft. 4 in. moulded depth, built to the highest class at Lloyd's under special survey, having short full poop and topgallant forecastle connected together by a shade deck. A deckhouse aft is fitted up for officers and engineers, and also contains entrance to the saloon and staterooms in the poop. Amidships a large house is fitted containing captain and passengers berths, and the crew is berthed in the topgallant forecastle. Special attention has been paid to the ventilation throughout, as the vessel is to trade in the Red Sea and will carry passengers, mails, and cattle. She is also arranged to pass the Indian Marine Law. The vessel is provided with steam winch and steam crane by Messrs. Clarke, Chapman & Co., and has extra large cattle doors under shade deck to facilitate transport of live stock; combined hand and steam steering gear by Messrs. Davis & Co., patent windlass by Messrs. Emerson, Walker & Thomson Bros,, Limited, tri-compound engines having cylinders 13½ in., 22 in., 36 in., by 24 in. stroke, 160 lbs. pressure, by Messrs. Westgarth, English & Co., Middlesbrough-on-Tees, which include all the latest improvements in marine engineering. The vessel is built upon very fine lines, and will have a speed of 11½ knots. She is built for Messrs. Luke Thomas & Co., Limited, of London and Aden, and is designed for their special trade. During construction both hull and machinery have been inspected by Mr. F. J. Trewent, of London, on behalf of the owners. She was gracefully named *Falcon* by Mrs. Atkinson, of London.

Fisher Prince.—On July 27th Messrs. J. T. Eltringham & Co. launched at South Shields the steel and iron steam trawler *Fisher Prince*, which vessel has been constructed to the order of Mr. W. H. Storey, North Shields. In all respects she is a sister ship to the *African Prince*, launched a few weeks ago, the dimensions being 95 ft. by 19 ft. by 11 ft., with compound engines, having cylinders 16 in. and 33 in. by 22-in. stroke. This is the ninth order which Messrs. Eltringham have executed for the same owner.

Oceano.—On Tuesday, July 28th, Sir Raylton Dixon & Co. launched from their Cleveland Dockyards, Middlesbrough, a very handsome screw steamer, 320 ft. by 43 ft. 3 in. by 25 ft., built to the order of Messrs. Gellatly, Hankey, Sewell & Co., of London, and intended for the River Plate trade. The vessel is of the spar-deck type with poop bridge and forecastle, classed 100 A1 at Lloyd's, and has a deadweight capacity of about 4,200 tons on a light draught of water. The accommodation for captain, officers, and engineers is in houses on bridge-deck and crew in topgallant forecastle. The engines by Messrs. The North Eastern Marine Engineering Co., Limited, Wallsend are of the triple-expansion type, having cylinders 23 in., 36 in. and 59 in. by 42 in., and supplied with steam by two large single-ended boilers working at 180 lbs. pressure and fitted with Howden's system of forced draught, duplicate fan engines, and other improvements. The boilers are also constructed to pass German law requirements. On leaving the ways she was named *Oceano*.

Premier.—On July 28th Messrs. Cook, Welton & Gemmell launched at Hull a steam trawler for Messrs. Richard Simpson & Co., Limited. The vessel was christened the *Premier*, and was afterwards towed into the Victoria Dock, where she will take in her boiler, engines, and necessary outfit.

Violet and Lobelia.—On July 28th there was launched from the yard of Messrs. Cochrane & Cooper, at Grovehill, a steam trawler, built to the order of the Arctic Steam Fishing Co., Limited, Grimsby, of the following dimensions:—95 ft. by 20 ft. 6 in. by 11 ft. depth of hold. She will be fitted with 40 N.P. triple-expansion engines by Messrs. C. D. Holmes & Co., of Hull. The launching ceremony was performed by Mrs. E. Bacon, who christened the vessel the *Violet*. The same day there was also launched a steam trawler, which has been built to the order of the North-Eastern Steam Fishing Co., Limited, Grimsby. The vessel, which is 95 ft. by 20 ft. 6 in. by 11 ft. depth of hold, and fitted with 40 N.P. triple-expansion engines by Messrs. C. D. Holmes & Co., was named the *Lobelia* by Miss Alice Allen.

Greenore.—On July 28th a steel paddle steamer of about 200 tons gross was launched at South Shields, owned by the London and North-Western Railway Co.

Karthago.—On July 28th there was launched by Messrs. J. Priestman & Co., at Sunderland, to the order of Messrs. A. C. de Freitas & Co., Hamburg, the steel screw steamer *Karthago*. She is intended for their passenger and general trade between Hamburg, South Brazil, and the River Plate. The principal dimensions are:—Length, 312 ft.; breadth, 42 ft.; depth, moulded to spar-deck, 27 ft. 6 in.; and she is constructed to the highest class in Lloyd's Registry for spar-deck vessels. The engines will be of the triple-expansion type, and have been built by Messrs. Blair & Co., Stockton. The cylinders are 22½ in., 37 in., and 61 in. respectively, having a 42 in. stroke. These are supplied with steam at 160 lbs. pressure by two large steel single-ended boilers. The vessel and engines have been under the supervision of Max Rother, engineer, of Hamburg, on behalf of the owners.

Coro-Coro.—On Tuesday, July 28th, Messrs. Wigham Richardson & Co. launched from their Neptune shipyard, Newcastle-on-Tyne, a steel screw steamer which they are constructing to the order of the New York and Pacific Steamship Co., of London, for their West Coast service. The vessel is 379 ft. in length by 48 ft. beam, she has a poop, bridge and topgallant forecastle, and will be rigged as a fore-and-aft schooner. She is to be fitted with triple-expansion engines, which, with the boilers, are also being constructed by Messrs. Wigham Richardson & Co. The boilers are fitted with Serve tubes and Ellis & Eaves induced draught arrangement. She will also have a very complete equipment for working both ship and cargo, including an installation of electric light wherein attention has been paid to arrangements of cargo lights, &c., and eight large steam winches, powerful steam windlass, &c. The owners were represented at the launch by Mr. T. Todd, of London, their superintendent engineer, under whose care the vessel is being constructed. Captain Thomas, who will take command of the vessel, was also present. As the vessel left the ways she was named the *Coro-Coro*, the ceremony being gracefully performed by Miss Molly White, of Hastings.

Holywell.—On Wednesday afternoon, July 29th, Messrs. Joseph L. Thompson & Sons, Limited, of the North Sands Shipbuilding Yard, Sunderland, launched the s.s *Holywell*, a modern cargo steamer, built to the order of the Tyzack & Branfoot Steam Shipping Co., Limited, of Sunderland. Her principal dimensions are:—Length between perpendiculars, 350 ft.; breadth, extreme, 45 ft.; depth, moulded, 26 ft. 8 in. She is built on the spar-deck rules to Lloyd's highest class, and is designed to carry a deadweight cargo of about 5,200 tons on a moderate draught of water. The vessel is built on the cellular double-bottom principle, arranged for water ballast, which is also carried in the after-peak. There are six watertight bulkheads, and iron longitudinal bulkheads right fore and aft. Accommodation is provided in the poop for the captain, three passengers' berths having two beds in each, steward, a large handsome saloon, pantry, bath-room, stores, &c. The officers and engineers are berthed in side-houses at the after-end of the bridge, the mess-room and steam steering being placed at the after-end of the casings. The forecastle is fitted up for the accommodation of the seamen and firemen, petty officers, lamp-room, paint-room, &c. The charthouse and galley are placed on top of the bridge deck, and on top of this house is placed a teak steering house. The vessel is rigged as a two-masted schooner. The hatches are worked by five powerful steam winches, double derricks being fitted at the main hatches, and a portable derrick fitted to two combined derrick and ventilator posts at the reserve bunker hatch. A patent steam windlass is fitted on the forecastle head, patent steam steering gear amidships, and a screw gear aft. A large multitubular donkey boiler for working the deck machinery is placed in the engine and boiler casings. Two lifeboats are fitted on the bridge deck, and two small boats on the poop deck. The vessel will be fitted with all the requisite gear for the rapid handling of cargo, and is specially designed and arranged for the American trade. The vessel was gracefully christened, and launched by hydraulic power, by Miss Winnie Branfoot, daughter of Mr. W. J. Branfoot, one of the managing owners. The launch was most successful in every way. Afterwards the company adjourned to the offices of the firm, where the usual toasts were duly honoured. This is the seventh vessel built by Messrs. Joseph L. Thompson & Sons, Limited, for Messrs. Tyzack & Branfoot.

Aysgarth.—On August 8th there was launched a steel screw steamer from the shipbuilding yard of Messrs. John Readhead & Sons, West Docks, South Shields, to the order of the Clapham Steamship Co., Limited, Newcastle-on-Tyne. She is of the improved single-deck type, having poop aft, and long bridge with accommodation for officers, and topgallant forecastle forward for crew. Her dimensions are as follows:—Length, 323 ft.; breadth, 47 ft.; depth, moulded, 25 ft.; her deadweight capacity being about 5,150 tons on a light draught. Her engines, also constructed by Messrs. John Readhead & Sons, are of the triple-expansion type, having cylinders 24 in., 40 in., and 64 in., by 42 in. stroke, steam being supplied by two large steel boilers working at a pressure of 160 lbs. per square inch. As the vessel left the ways she was named the *Aysgarth* by Mrs. Colin Forbes, of Jesmond. This is the fourth vessel built by Messrs. John Readhead & Sons for the above firm.

Balderton.—On Tuesday, August 11th, Messrs. Wm. Gray & Co., Limited, launched a fine steel screw steamer built to Lloyd's highest class, and of the following dimensions:—Length, overall, 324 ft.; breadth, 44 ft.; and depth, 23 ft. 3 in. The deck erections consist of a poop, bridge over machinery space, and topgallant forecastle. A handsome saloon and cabins for officers, &c., are fitted in the poop, the engineers' rooms in the bridge, and the crew's accommodation forward. The hull is built on the web-frame system with a cellular double bottom, large hatchways, powerful steam winches, steam steering gear amidships, hand screw gear aft, large donkey boiler, patent direct steam windlass, boats on beams overhead, shifting boards throughout, stockless anchors, two masts with schooner rig, and a complete outfit for a first-class cargo vessel. The Central Marine Engine Works of Messrs. Wm. Gray & Co., Limited, supply triple-expansion engines, having cylinders 23 in., 36 in., and 62 in. diameter, with a 39 in. piston stroke, and two large steel boilers to work at 160 pressure per square inch. The ceremony of christening the steamer *Balderton* was gracefully performed by Mrs. Farmer, daughter of Sir William Gray, and wife of the vicar of Balderton.

Liv.—On August 11th Messrs. Ropner & Son launched at Stockton-on-Tees a steel screw steamer built to the order of a Norwegian firm, for whom Messrs. Ropner & Son have already built several steamers. Her dimensions are as follows:—Length, between perpendiculars, 322 ft.; breadth, extreme, 41 ft. 6 in.; and depth, moulded, 24 ft. The vessel has a part-awning deck, poop, and raised quarterdeck. She will be fitted with a set of triple-expansion engines by Messrs. Blair & Co., Limited. The christening ceremony was gracefully performed by Mrs. Hansen, the wife of the superintending captain, who gave the steamer the name of *Liv*.

Othello.—On Monday, August 24th, the s.s. *Othello* was launched from the yard of Earle's Shipbuilding and Engineering Co., Limited, Hull, for the Bombay trade of Messrs. Thos. Wilson, Sons & Co., Limited. She will have a greater carrying capacity than any steamer sailing out of this port. Her dimensions are:—Length, 420 ft.; breadth, 48 ft.; depth, moulded, 32 ft. She is built of steel to the highest class in the British Corporation Registry and on the cellular system of framing; there are two complete flush decks of steel, and below these in lieu of beams large web frames are fitted at intervals, thus giving a very roomy clear hold for cargo. The ship has a short poop aft, a bridge over the engines and boilers and extending some distance forward of the same, and a topgallant forecastle. The hatches are large and have very efficient lifting power, consisting of 10 steam winches and gear. The masts, two in number, are fully utilized also for supporting derricks, and there are in addition eight massive steel columns standing vertically from the deck to carry further derricks. The whole of the appliances for working cargo are such as to give the greatest possible dispatch in loading and unloading. A powerful steering engine by Amos & Smith is fitted in the engine casing and actuated by a wheel from the bridge, forward of this, and a screw hand gear is fitted aft, with spring brakes and relieving tackle. The saloon, with accommodation for passengers, captain, and all conveniences, is in a steel house at the fore end of the bridge with a steel chart-house above. The ship has two pole masts of steel with light fore-and-aft rig, and she will be fully equipped with boats and all the necessary outfit suitable for the service for which she is intended. The total deadweight to be carried will be nearly 8,000 tons, and she is expected to steam 10½ knots. For this purpose she will be fitted with a fine set of triple-compound engines, also made by Earle's Co., and of their newest design, steam for which at 200 lbs. pressure will be supplied from three large steel boilers.

Andalusia.—On August 25th there was launched from the Jarrow Yard of Messrs. Palmer's Shipbuilding and Iron Co., Limited, a large screw steamer, built to the order of the Hamburg-American Steam Navigation Co., Hamburg. Her dimensions are as follows:—Length, between perpendiculars, 400 ft.; beam, 50 ft.: depth, moulded, about 30 ft. 3 in. The vessel will be rigged as a two-masted fore-and-aft schooner, and has been constructed under special survey to obtain German Lloyd's highest class, and is of the three-deck type, with a combined poop and bridge, extending to after end of main hatch, and a topgallant forecastle. The main and upper decks are of steel all fore and aft, and all the exposed decks are sheathed with wood. A double bottom for water ballast is fitted all fore and aft, and divided at the centre line for the purpose of assisting to trim the vessel, a separate system of piping being fitted on each side of centre line division, enabling each department to be fitted and emptied independently. The vessel has been designed for the emigrant, cattle, and general cargo trade, and will be lighted throughout by electricity, and fitted complete with all the latest improvements for this service. The accommodation for the captain, officers, engineers, and also galley and emigrants' hospital, &c., will be in deckhouses on the top of the bridge, and in houses in fore end of bridge; and also part of the lower 'tween deck aft will be fitted with accommodation for 300 or 400 emigrants. The emigrants' berths are of Hoskins' latest patent, and are fitted along each side in separate rooms for 10 persons each, the centre of the deck being left clear for the tables, seats, &c. The whole of the fittings are portable, and the space may thus be readily converted for carrying cattle or general cargo. The remainder of the 'tween decks not occupied by the emigrants will be fitted for cattle, and a complete system of water service, sidelights, fan, ventilators, &c., will be supplied and fitted as in first-class cattle boats. A small insulated space is fitted in the lower hold aft with refrigerating machinery, &c., complete for stowing ice, vegetables, and meat, for the use of the emigrants and crew. The remainder of space in lower holds to be fitted for general cargo, and a complete system of steam winches, derricks and steam cranes for the efficient working of general cargoes will be fitted. The engines, which are also built by the Palmer Co., are of the four-crank quadruple-expansion type on the Schlick system, with cylinders 22½ in., 32 in., 47 in. and 68 in., and 51 in. stroke, steam being supplied by one double and two single-ended cylindrical boilers, working pressure of steam 210 lbs. All modern apparatus and appliances for the most efficient and economical working are being fitted, and the whole of the vessel and machinery is being constructed to meet the requirements of the German emigrant service. As the vessel left the ways she was gracefully christened the *Andalusia* by Frau Magin, after which the company adjourned to the luncheon room, where the usual congratulatory toasts were honoured.

LAUNCHES—Scotch.

Steam Yacht.—On July 27th Messrs. Chambers Brothers, boatbuilders, Greenock, launched from their yard in Main Street a fine steam yacht of 70 tons. It has been built to the order of an English gentleman.

Tarpon.—On July 27th Messrs. Chambers Brothers launched at Greenock a steam yacht of the following dimensions:—Length over all, 60 ft.; breadth, 10 ft. 6 in.; and depth, moulded, 6 ft. The engines, which have been supplied by Mr. Robert Montgomery, are of the compound surface-condensing type, to indicate about 60 H.P., and capable of propelling the vessel at about 10 knots. The boiler (return tubular) has been constructed for a working pressure of 120 lbs. to the square inch. Considerable interest was evinced in the launch, in that it was the first by Messrs. Chambers in Greenock since taking over their new premises in May last. The yacht was christened *Tarpon* by Mrs. Good, wife of the owner.

Burma.—On July 28th Messrs. Wm. Denny & Bros., Leven Shipyard, Dumbarton, launched from their yard a steel screw steamer of the following dimensions:—344 ft. by 44 ft. 6 in. by 28 ft. 6 in. The vessel has been built for Messrs. Patrick Henderson & Co., Glasgow, and will be engaged in their Rangoon trade. She has been built to the highest class of the British Corporation. On leaving the ways she was christened the *Burma*, by Mrs. Galbraith, wife of Mr. John A. Galbraith, one of the members of Messrs. Henderson's firm.

Briton.—On July 31st the *Briton*, an addition to the coasting fleet of Messrs. J. & J. Hay, Glasgow, was launched from the firm's yard at Kirkintilloch. The vessel is 66 ft. long, 18 ft. deep, and 9 ft. 6 in. across. She has a carrying capacity of 110 tons, and is to be engined by Messrs. Ross & Duncan, Govan. The christening ceremony was performed by Miss R. W. Anderson, Oxford Cottage.

Pearl.—On August 8th there was launched from the shipbuilding yard of Messrs. John Shearer & Son, Kelvinhaugh, a handsome steel screw steamer, 185 ft. by 29 ft. by 13 ft., moulded, 690 tons register, built to the order of Mr. W. Robertson, Glasgow, for his celebrated Gem Line. The vessel has full forecastle, bridge-house, and quarterdeck, and is fitted with electric light, patent windlass, steam steering gear amidships, and screw gear aft. Her machinery is being supplied by Messrs. Muir & Houston. As the vessel began to move down the ways the christening ceremony was gracefully performed by Miss MacGregor, Manchester, who named her the *Pearl*.

Portugal.—On August 8th Messrs. Murdoch & Murray, shipbuilders, Port-Glasgow, launched a small steel screw steamer named *Portugal*, to be engaged in the Amazon passenger and cargo traffic. The machinery will be supplied by Messrs. Hall-Brown, Buttery & Co., Govan.

Huskisson.—On August 11th Messrs. John Cran & Co., Leith, launched a powerful steam tug for the Alexandra Towing Co., of Liverpool. Her dimensions are—95 ft. by 20 ft. by 11 ft. 6 in., and Messrs. Cran fit her with C.S.C. engines of 475 H.P. of the most modern design. She was named the *Huskisson* as she left the ways by Mrs. Hudson, Liverpool.

Rotterdam.—On August 11th there was launched by Messrs. Gourlay Brothers & Co., at Dundee, a new steamer for cargo and passengers, built to the order of Messrs. James Rankine & Son, Glasgow and Grangemouth. The vessel is 250 ft. in length, 32 ft. in breadth, 17 ft. in depth, and her gross tonnage is 1,100. She is to be engaged in the Rotterdam and Grangemouth trade. She was named the *Rotterdam*, and is to be fitted with triple-expansion engines.

Falkirk.—On August 11th Messrs. Wm. Hamilton & Co. launched from their Glen Yard, Port-Glasgow, a steel barque of about 1,985 tons gross and about 1,870 tons net register tonnage, to carry about 3,400 tons deadweight, for Messrs. Potter Bros., 112, Fenchurch Street, London. The following are the principal dimensions:—Length, about 270 ft., breadth, 40 ft.; depth, moulded, 25 ft. 1½ in. The vessel has been built to the highest class at Lloyd's, and is fitted out in the modern manner for the quick and easy working of the ship. The accommodation for the officers and crew is of the most complete description, the captain and officers being placed in the poop, while the crew are berthed in large deck-house amidships, and the store and lamp-rooms are placed under the topgallant forecastle. A teak deck-house containing stairway to saloon with chart-room is fitted on the poop deck. The saloon is tastefully panelled in polished oak, with carved mouldings and pilasters, the sofas and chairs being upholstered in crimson Utrecht velvet. As the vessel left the ways she was gracefully named the *Falkirk* by Mrs. Thomas Potter.

Glenturret.—On August 11th the London and Glasgow Engineering and Iron Shipbuilding Co., Limited, launched at Govan the second of two large steel screw steamers building to the order of Messrs. M'Gregor, Gow & Co., London, for their Glen line of steamers. The vessel's dimensions are 400 ft. by 49 ft. by 31 ft. moulded, with a gross tonnage of about 4,850 tons, and she will have a deadweight carrying capacity of 7,000 tons, cargo capacity of about 8,750 tons, and water ballast tanks in double bottom for about 840 tons. The main and upper decks are of steel, and the upper deck and bridge decks are covered with yellow pine. The forecastle deck is teak. The vessel has seven watertight bulkeads extending to the upper deck, having a watertight door between decks in each to facilitate the transfer of cargo. To load or discharge cargo speedily the derricks are stepped on specially-constructed columns so placed that cargo may be brought from both sides of the ship simultaneously. There are ten large steam winches, supplied by Messrs. Clarke, Chapman & Co. Messrs. Caldwell & Co.'s steam steering gear is fitted in the aft end of the engine casing and in communication with the engine-room. The captain's, officers', and state-rooms, also the dining-saloon, are situated on the bridge deck at the fore end of engine and boiler space, each officer having a large and airy apartment heated by steam and lit by electric light. The engineers have the same style of accommodation as the officers, their rooms being built round the engine casing. Great attention has been paid to the crew's accommodation, which is under the long forecastle. Their sleeping rooms, besides being well lit and ventilated, have a large circular steel skylight fitted through each side of the forecastle deck. In these ships a special feature has been introduced in providing a mess-room for the crew. The vessel is to be lit throughout by electric light, the installation being by Messrs. Clarke, Chapman & Co. The propelling machinery (supplied by the builders) consists of one set of triple-expansion engines, having pistons 29 in., 47 in., and 77 in. diameter, all having a stroke of 54 in., and capable of working up to 3,500 H.P. Steam is supplied by three single-ended boilers, constructed for a working pressure of 170 lbs. per square inch, and fitted to work with Howden's system of forced draught. The machinery department is supplied with all the most modern appliances for economical working, including Weir's heater and pumps, Rayner's evaporator, &c. There is also a powerful auxiliary boiler capable of supplying steam for driving the ten cargo winches. As the vessel left the ways she was named the *Glenturret* by Miss Gow, of Hayston, Kelvinside.

Cumbria.—On August 12th there was launched by the Ailsa Shipbuilding Co., Troon, a steel screw steamer for Messrs. Robert Tedcastle & Co., of Dublin, for their passenger, cargo, and cattle trade between Dublin, Liverpool, Whitehaven, and Maryport. Her dimensions are:—Length between perpendiculars, 198 ft.; breadth, moulded, 29 ft. 10 in.; depth, moulded, 14 ft. 9 in. The engines are being supplied by Messrs. Dunsmuir & Jackson, and are triple-expansion, having 19 in., 31 in., and 51 in. cylinders, by 33 in. stroke. She is fitted throughout with electric light, and has all the newest appliances for comfort and safety and for rapid loading and discharging of cargo. The christening ceremony was performed by Miss M. C. Spiers, Frith View, Ayr, who named the vessel *Cumbria*.

Lord Wolseley.—On August 12th Messrs. Hawthorn & Co. launched at Leith an iron screw steamer named the *Lord*

Wolseley, built to the order of the Admiralty. The steamer, which will be supplied by the builders with engines of 450 H.P., is intended for the transportation of heavy guns, ammunition, and other war material.

Ilorin.—On August 14th Messrs. David J. Dunlop & Co., Inch Works, Port-Glasgow, launched the steel twin-screw steamer *Ilorin*, built to the order of the African Steamship Co., of London, for their branch service on the West Coast of Africa, and immediately thereafter the vessel was moored alongside the yard wharf to receive her machinery, &c., consisting of two sets of triple-expansion engines, having cylinders 13 in., 21 in., and 34 in. by 24 in. stroke, of the latest and most modern design. The *Ilorin* is somewhat similar to the *Ibadan*, built and engined by Messrs. Dunlop four months ago for the same owners. Her dimensions are:—Length, 220 ft.; beam, 36 ft.; moulded depth, 14 ft.; and classed 90A in Lloyd's Registry, gross tonnage being about 900 tons. All arrangements for easily maintaining steam in the tropics are being fitted; the steam steering-gear is Harrison's patent, the engine being placed in engine-room directly under the control of the engineers. The deck machinery includes direct steam windlass and five steam winches, all of Messrs. Clarke, Chapman & Co.'s make, with their derricks. The poop bridge and forecastle, which are arranged to give exceptionally good light and ventilation, are fitted with cabin and saloon for officers, engineers, &c., the crew and firemen being located under the forecastle. The captain's cabin is fitted on the bridge deck in a large teak deck-house. From this bridge the steamer is navigated. Awnings over the entire length of the vessel are provided, those over the poop and steam winches being fitted of steel framing, with canvas-covered, tongued and grooved planking. The rig is that of a two-masted fore-and-aft schooner. On leaving the ways the vessel was gracefully named by Mrs. Rattray, wife of Captain W. R. Rattray, the superintendent for the owners.

Yucatan.—On August 20th Messrs. Archibald M'Millan & Son, Limited, Dockyard, Dumbarton, launched a steel screw steamer of dimensions 215 ft. by 30 ft. by 20 ft. 6 in., which is the first of two steamers being built to the order of Senor Don Domingo Abaunza, of Tabasco, for passenger and general carrying trade in the Gulf of Mexico. The vessel has a poop, shade deck, and topgallant forecastle. Handsome accommodation is provided for 50 first-class passengers, including saloon, smoke-room, &c. Every arrangement has been made for the efficient working of the vessel; and the machinery, which is on the triple-expansion principle, is being supplied by Messrs. R. Napier & Sons, Limited, of Glasgow. She has been built to Lloyd's highest class, and under the superintendence of Mr. James Rode, of Liverpool. The ceremony of naming the vessel *Yucatan* was performed by Miss Jean Gow M'Millan, of Methlan Park, Dumbarton.

Trafford.—On August 20th Messrs. Mackie & Thomson launched a steel screw steamer of 300 tons, which they have built for the Trafford Steamship Co., Manchester. Dimensions:—Length, 128 ft.; breadth, 20 ft.; and depth, 10 ft. 3 in. Compound surface-condensing engines, with boilers to work at a pressure of 120 lbs., and all the latest improvements, will be supplied by Messrs. Muir & Houston. Mrs. Morris, wife of one of the directors of the owners' company, named the vessel *Trafford*.

Itaha.—On Saturday, August 22nd, Messrs. Scott & Co., shipbuilders, Greenock, launched the twin-screw steel steamer *Itaha*, built to the order of the Companhia Nacional de Navegaco Costeria, Rio de Janeiro. She is a steamer of about 500 tons gross, and is the first of three at present being built by Messrs. Scott. She is intended for the coasting trade from Rio Janeiro.

LAUNCH.—AMERICAN.

Creole.—On August 8th there was launched the s s. *Creole*, She is a passenger and freight steamer, built for the Cromwell Steamship Co., by the Newport News Shipbuilding and Dry Dock Co., from the designs and under the superintendence of Mr. Horace See, for service between New York and New Orleans. Her principal dimensions are:—Length, over all, 375 ft.; breadth, moulded, 44 ft.; depth, moulded, 32 ft. 6 in. The hull is built entirely of steel, with three continuous decks and a partial orlop deck forward, and a promenade deck on top of main deckhouse extending about 170 ft. in length. The *Creole* is the first vessel sailing out of New York in the coast-wise trade to be fitted with a water bottom, which is not only a convenience, but also a very great safeguard, as it gives her an inner and outer shell. Besides this her hull is subdivided into a number of watertight compartments by means of transverse bulkheads. Her outside plating has vertical lap joints below the water line. She is rigged with two steel pole masts and the necessary booms for handling cargo. The *Creole* has accommodation for 75 first-class passengers amidships in the most comfortable part of the ship, and for 150 steerage passengers aft. The large dining-saloon, located at the forward end of and extending to the full width of the deck-house, is lighted by extra large round sidelights, giving an unobstructed view forward and on both sides of the ship. The general arrangement of the passenger accommodation is, in many respects, a new departure from the usual type of our coast-wise passenger steamers, and is more on the plan of the modern Transatlantic steamship. The social-hall is fitted with piano, library, &c. Both dining-saloon and social-hall have electric ventilating fans. The smoking-room for first-class passengers at after-end of promenade deck is large, and fitted with all the conveniences of an ocean-going vessel. There are two large lobbies, one on upper deck and one on promenade deck, connected by the main companionway. The deck accommodation is large, and well protected by awnings, &c. All state-rooms for first-class passengers and officers have good light and are well ventilated. The vessel is lighted throughout by electricity. A powerful search-light is placed at the "crow's nest" on the foremast. All running lights are connected to a Russell-See electrical indicator placed in the pilot-house. Lifeboats, rafts, &c., of the latest design are fitted according to the United States Steamboat Inspection Laws. The outfit will be the very best, and most complete in every department. Steam steering gear, hoisting engines, steam windlass, capstans, deck pumps, engine telegraph, &c., will all be of the latest and most improved design. The main engine is of the vertical triple-expansion type, with cylinders 28 in., 44 in., and 74 in. diameter, and 54 in. stroke. The valves are of the piston slide variety, worked by the See-Marshall valve gear, each valve receiving its motion from a separate eccentric. Steam is furnished by three cylindrical double-ended steel boilers, each having six corrugated furnaces with a common combustion chamber. The working steam pressure is 180 lbs. The circulating pump is centrifugal, and driven by an independent engine. The See hydro-pneumatic ash ejector will be fitted in each fire-room for discharging ashes. In the construction of the vessel particular attention has been paid to the comfort of the passengers, and every effort made to have her first-class in every respect.

LAUNCH.—GERMAN.

Konig.—On August 15th there was launched from the Reiherstieg shipbuilding yard at Hamburg a new steel steamship, built to the order of the Deutsch-Ost-Afrika Linie. She is to be employed as one of the German Imperial mail steamships to East Africa, and has a length of 400 ft., a breadth of 47 ft. 3 in., a depth of 33 ft., and will carry 6,500 tons deadweight. She is a sister ship of the *Herzog*, built by Messrs. Blohm & Voss, and now on her maiden trip to Africa, and will be provided with twin-screws and engines of the triple-expansion type, indicating 2,500 H.P. The *Konig* has nine watertight bulkheads, reaching up to the main deck, the doors of which may be closed by a mechanism within half a minute, so that every hold can be separated completely from the others. She was named the *Konig* when leaving the ways, and will be arranged to accommodate first, second, and third class passengers, and also emigrants in the 'tween decks. All the cabins, saloons and state-rooms, as well as the 'tween decks, are ventilated for the tropics. The electric light is to be fitted throughout.

TRIAL TRIPS.

Borjom.—On July 24th this vessel was taken on her trial trip off the Tyne. The s.s. *Borjom*, which has been built by Messrs. Sir W. G. Armstrong & Co., under the supervision of Messrs. Flannery, Baggallay & Johnson, of London and Liverpool, is of the following dimensions:—Length, 320 ft.; breadth, 42 ft.; depth, moulded, 22 ft. 2 in. The vessel has been constructed to the order of Mr. A. Mantachoff, of Tiflis, for the transport of petroleum in bulk. She is of a somewhat novel design for an oil steamer and embodies much of the w
or turret type. She is fitted with very power

machinery for the quick discharge of liquid cargo in addition to a complete plant of winches and derrick gear for dealing with case oil cargo which it is intended to carry. The North-Eastern Marine Engine Works, of Sunderland, have supplied the engines, which are of ample power, having cylinders of 24 in., 40 in., 64 in., by 42 in. stroke; the vessel attained a speed of 10·75 on her trial in a light condition. The boilers are also fitted with appliances for burning liquid fuel, a special installation of a very complete character having been fitted with this end; alternate fittings for coal are supplied, and trials were made with both solid and liquid fuel. The vessel is lighted throughout with electric light, and her arrangements for the special trade are of the most complete character.

Adria.—On July 28th the s.s. *Adria*, built by Palmer's Shipbuilding and Iron Co., Limited, to the order of the Hamburg-American Steam Navigation Co., was taken to sea for her official steam trial. Her dimensions are as follows:—Length, between perpendiculars, 400 ft.; beam, 50 ft.; depth, moulded, about 30 ft. 3 in. The vessel will be rigged as a two-masted fore-and-aft schooner, and has been constructed under special survey to obtain German Lloyd's highest class, and is of the three-deck type, with a combined poop and bridge extending to after end of main hatch, and a topgallant forecastle. The main and upper decks are of steel all fore-and-aft, and all the exposed decks are sheathed with wood. A double bottom for water ballast is fitted all fore-and-aft, and divided at the centre line for the purpose of assisting to trim the vessel, a separate system of piping being fitted on each side of centre line division enabling each compartment to be filled and emptied independently. The vessel has been designed for the emigrant, cattle, and general cargo trade, and will be lighted throughout by electricity, and fitted complete with all the latest improvements for this service. The accommodation for the captain, officers, and engineers, and also galleys and emigrant hospitals, &c., will be in deckhouses on the top of the bridge, and in side houses in fore-end of bridge; and also part of the lower 'tween deck aft will be fitted with accommodation for 300 to 400 emigrants. The emigrants' berths are of Hoskin's latest patent, and are fitted along each side in separate rooms for ten persons each, the centre of the deck being quite clear for the table, seats, &c. The whole of the fittings are portable, and the space may thus be readily converted for carrying cattle or general cargo. The remainder of the 'tween deck not occupied by the emigrants will be fitted for cattle, and a complete system of water service, sidelights, tank ventilators, &c., will be supplied and fitted as in first-class cattle boats. A small insulated space is fitted in the lower hold aft with refrigerating machinery, &c., complete for stowing ice, vegetables, and meat for the use of the emigrants and crew. The remainder of space in lower holds to be fitted for general cargo, and a complete system of steam winches, derricks, and steam cranes for the efficient working of general cargoes will be fitted. The engines, which are also built by the Palmer Co., are of the four crank quadruple-expansion type on the Schlick system, with cylinders 22½ in., 32 in., 47 in. and 68 in., by 51 in. stroke, steam being supplied by one double and two single-ended cylindrical boilers; working pressure of steam, 210 lbs. All modern apparatus and appliances for the most efficient and economical working are being fitted, and the whole of the vessel and machinery is being constructed to meet the requirements of the German emigrant service. During the trial the engines worked for a considerable time in a highly satisfactory manner at 75 revolutions per minute, and a mean speed of 12½ knots was attained on the measured mile.

Innisfallen.—On July 30th a very finely modelled screw steamer, which is destined for the Irish Channel passenger service, went for her trial trip off the River Tyne. The vessel is named the *Innisfallen*. She has been constructed by Messrs. Wigham Richardson & Co., at their Neptune Works, Newcastle-on-Tyne, for the City of Cork Steam Packet Co., Limited, and is intended to run on the various services of the company, but principally between Milford and Cork in connection with a new fast service of trains on the great Western Railway between London and Milford. The *Innisfallen* is built of steel, 283 ft. in length by 35½ ft. beam. She has two funnels, is rigged as a fore-and-aft schooner, and is fitted with a complete system of water ballast. She has very luxurious accommodation for about 100 first-class passengers, including main saloon, ladies' saloon, &c. The principal saloon is upholstered in green embossed velvet, and the walls are of mahogany with inlaid marqueterie and carved panels. Another special feature here is that the windows can be covered at will with photographic transparencies of yachting scenes. The ladies' room and state-rooms are also upholstered in the same style, and the flooring all throughout the first-class accommodation is of marble mosaic work. There is a spacious promenade deck 114 ft. in length, and on it a very snug smoking-room. The accommodation for other than saloon passengers is partly forward and partly amidships on the main deck. The vessel is also fitted for carrying a large number of horses, cattle, &c., and she can be quickly converted into a troop ship. All the ship is lighted by electric light, and the heating is by steam. The machinery for working the ship and cargo is of the most modern and improved character, consisting of a steam crane, two Temperley's transporters, three steam winches, a steam windlass, steam steering gear, etc. The machinery and boilers have also been entirely constructed by Messrs. Wigham Richardson & Co. The engines are of the triple-expansion type, having four cylinders and four cranks, and are self-balanced on the well-known Yarrow, Schlick and Tweedy system. On the trial trip they worked without the slightest hitch, and entirely without that vibration which is so distressing to passengers The trial trip was attended by Major Lyons, the chairman, and Mr. de Fonbert, the secretary of the City of Cork Steam Packet Co., who expressed themselves as perfectly satisfied with the vessel, a very high rate of speed being attained. There were also present Mr. Tweedy, of the builders' firm, and Mr. Zierold, the superintendent engineer for the City of Cork Steam Packet Co.

Zuid Holland.—On Friday, July 31st, the steel screw collier *Zuid Holland*, built by Sir Raylton Dixon & Co., Cleveland Dockyards, Middlesbrough, to the order of the American Petroleum Co., Rotterdam, for the Scheepvaart en Steenkoln Maatschappij, proceeded out to sea under the command of Captain Voss, for her official trial trip. Her principal dimensions are:—229 ft. by 34 ft. by 17 ft. 6½ in. moulded, and she has a deadweight capacity of about 1,700 tons. She is built to Lloyd's 100 A1 class, having raised quarterdeck with bridge and forecastle decks of pitch pine, main and quarter decks iron, water ballast in cellular bottom, and plate keel. This steamer has also been specially fitted with very strong towing gear for towing the 1,000-ton barges which have been recently constructed by Sir Raylton Dixon & Co. for the same company, and are to be employed in the carrying of coals direct from the North-East Coast of England to alongside steamers in Rotterdam and adjacent ports. Triple-expansion engines have been supplied by Messrs. The North Eastern Marine Engineering Co., Limited, Sunderland, having cylinders 19 in., 31½ in., and 51½ in. by 36 stroke, supplied with steam by two single-ended boilers, working at 170 lbs. pressure. During the trial trip everything passed off most satisfactorily to all concerned. The vessel and the machinery have been constructed under the supervision of Messrs. Flannery, Baggallay & Johnson, of London.

Thornley—On Tuesday, August 4th, the new steel steamer *Thornley*, built by Messrs. C. S. Swan & Hunter, Limited, for Mr. W. R. Rea, of Belfast, and Mr. C. M. Legg, of Carrickfergus. was taken to sea for her trial trip. The principal dimensions of the vessel are:—Length, 312 ft. between perpendiculars; breadth, 41 ft.; and depth moulded, 23 ft. 1½ in.; and she is designed to carry a deadweight cargo of 4,350 tons, as well as a large measurement cargo. She is constructed on the partial awning deck principle, has a cellular double bottom throughout for water ballast, and a complete equipment of derricks and winches, and multitubular donkey boiler for the rapid handling of cargo. The machinery has been constructed by the North Eastern Marine Engineering Co., Limited, and consists of a set of their latest design of triple-expansion engines, having cylinders 23 in., 38 in., and 61 in. diameter by 39 in. stroke, and two steel boilers 14 ft. 9 in. diameter by 10 ft. long, working at 160 lbs. pressure. During the trial trip the machinery worked to the complete satisfaction of all on board, after which the *Thornley* returned to the Tyne to take her bunker coal before sailing for Antwerp and South Africa. The vessel and machinery have been superintended by Mr. J. Lewis, of Belfast, and the steamer will be commanded by Captain John Legg.

Aeon.—On August 4th the s.s. *Aeon*, built by Messrs. Ropner & Son, of Stockton-on-Tees, to the order of Messrs. Newman & Dale, of London, left the Tees for her official trial trip. Her compasses having been duly adjusted, a very satisfactory run was made, Mr. Dale, one of the managing owners, being present, and expressed himself highly pleased with the vessel's performance, both in regard to the vessel and her machinery; the engines are of ample power, having cylinders 22½ in., 37 in., 61 in., with 42 in. stroke, and powerful boilers. After the trip the steamer proceeded to the Tyne, where she will load for the River Plate.

Mars.—On August 5th the steel screw steamer *Mars*, built by Messrs. Wm. Gray & Co., Limited, for Messrs. Schmidt & Hansen, of Flensburg. went on her trial trip. She is a sister ship to the *Jupiter*, recently built for the same firm, and is intended for the timber and general cargo trades. Her dimensions are:—Length over all, 280 ft.; breadth, 39 ft.; depth, 18 ft. 2 in., and she is classed 100 A1 at Lloyd's. She has a long raised quarter-deck, long bridge, and topgallant forecastle and houses on deck for cabins. The hull is built with deep framing and cellular double bottom, and the equipment is of the most improved description, including patent donkey boiler, steam steering gear, four steam winches, &c. Triple-expansion engines have been supplied by the Central Marine Engine Works of Wm. Gray & Co., Limited, having cylinders 19 in., 30½ in., and 51 in. in diameter, respectively, with a piston stroke of 36 in., and steam is provided by a large steel boiler working at a pressure of 160 lbs. per square inch. The trial was in every respect satisfactory, and was witnessed by the managing owner, Captain Schmidt, Captain Murrell, of Wm. Gray & Co., Limited, and Mr. Jas. Lindsay, of the Central Marine Engine Works. Captain Johnasson is in command of the vessel, and on the completion of the trial the *Mars* at once proceeded to her loading port.

Mary Ada Short.—On August 6th the new steamer *Mary Ada Short*, built by Messrs. Short Brothers, of Sunderland, to the order of Mr. James Westoll, made a successful trial trip. She carries 5,700 tons deadweight on a comparatively light draught, and is said to be one of the largest single-decked vessels afloat. She is specially designed for the Azof and River Plate trades. She loads for Genoa, and will be under the command of Captain Milburn, of Sunderland.

Margarita.—On August 6th the twin-screw steam yacht *Margarita*, belonging to Mr. A. J. Drexel, of Philadelphia, and built by the Ailsa Shipbuilding Co., of Troon, ran a series of progressive trials on the Skelmorlie measured mile, and also extended runs between the Cloch and Cumbrae lights. During the trials the engines worked with great smoothness and regularity, and the results were highly satisfactory. The speed under natural draught of 14 knots per hour was easily attained, and under forced draught it was increased to 16½ knots per hour. A noteworthy feature of the trial was that at both high and low speeds there was an entire absence of vibration in the ship. She is a splendid specimen of the newest type of large pleasure steam yachts, and has been much admired for the beauty of her lines and general form, and her fittings and equipments are on an unusual scale of magnificence, being replete with every conceivable appliance for comfort and safety. This is the first of a series of very large steam yachts which have been designed by Mr. G. L. Watson for wealthy American owners, and which are exciting considerable interest on both sides of the Atlantic.

Taormina.—On Thursday, August 6th, the new steel screw steamer *Taormina*, built by Messrs. Robt. Duncan & Co., Limited, Port-Glasgow, for Mr. Jorgen C. Knudser, M.P., of Porsgrund, Norway, went on her official loaded trial trip on the mile distance at Skelmorlie, and between the Cloch and Cumbrae Lights. The results were satisfactory, and considerably over the guaranteed speed was obtained. Her dimensions are 235 ft. by 35 ft. by 21 ft. and 3,200 tons displacement, having a carrying capacity of 85,000 cubic feet. Water ballast is carried in double bottom all fore and aft, and in forward and after peak tanks, having the most modern arrangement of pumps, pipes and valves for pumping out the water ballast from stem to stern in the space of three hours. The accommodation for the officers is on the main deck amidships, where there are fitted a handsome saloon, mess-room, captain's, engineers', and officers' rooms, besides state-rooms for passengers. The quarters for the crew are forward on 'tween decks, which are commodious and well-ventilated, having separate baths, w.c.'s, urinals, &c., for firemen and sailors. On the top of deckhouse is a large teak-house, combining chart-house and wheel-house, erected with flying bridge above, on which are fitted steam steering-wheel, patent standard compass, with patent compass verifier or polaris. The engines, which are of the triple-expansion type, were supplied by Messrs. Muir & Houston, Limited, Glasgow, the diameters of cylinders being 19 in., 31 in., and 51 in., by 36 in. stroke. Steam is supplied by a steel boiler 15 ft. 6 in. diameter by 10 ft. 6 in. long at a pressure of 160 lbs. The machinery department is very complete, having Lockwood & Carlisle's patent piston rings, Morrison's patent feed heater and evaporator, Railton & Campbell's patent feed water filter, Worthington's latest patent duplex feed pumps, Sudron's patent donkey boiler, Molerup's patent impermeator, Geddes's patent furnace doors, Cockburn's patent safety valves, steam-steering gear, &c. The vessel and her machinery were constructed in accordance with the requirements of Det Norske Veritas for their highest class, and were superintended during construction by Captain Isaksen and Engineer Jacobsen.

Sardonyx.—On Monday, August 10th, the steel screw steamer *Sardonyx*, which has been built by Sir Raylton Dixon & Co., Cleveland Dockyards, Middlesbrough, to the order of Messrs. Hoyland & Co., London, for the Sardonyx Steamship Co., Limited, proceeded to sea for her official trial trip under the command of Captain Pasley, R.N.R. Her principal dimensions are—322 ft. by 40 ft. 6 in. by 28 ft. and has a deadweight capacity of about 4,650 tons. She is built to Lloyd's 100 A1 class on the deep frame system, and fitted with five bulkheads and cellular double bottom for water ballast. The spar deck is of iron, main deck of steel, and poop, bridge, and forecastle decks of wood, with handsome accommodation under bridge for captain, officers, and engineers. Triple-expansion engines have been supplied by Messrs. Thos. Richardson & Sons, Limited, of Hartlepool, the diameter of the cylinders being 23 in., 36 in., and 59 in., by 42 in. stroke, with two large steel boilers. The vessel and machinery have been built under the supervision of Mr. Robert Eeles, Newcastle-on-Tyne.

La Plata—On August 14th, the *La Plata*, built by Messrs. R. Napier & Sons, Limited, for the Royal Mail Steam Packet Co., London, had a most successful trial trip on the Firth of Clyde. The *La Plata* is the first of three steel screw steamers Messrs. Napier have on hand for the Royal Mail Co. These fine steamships have been specially designed to meet the requirements of the company's extra service to Brazil and the River Plate, and are intended to carry a large cargo, with comfortable accommodation for first-class passengers and emigrants. The general dimensions are:—Length, over all, 360 ft.; breadth, 44 ft.; depth, 27 ft., with a topgallant forecastle, long bridge and full poop, and a gross tonnage of 3,300 tons, built of steel to class 100 A1 at Lloyd's under special survey, and fitted in accordance with the Board of Trade regulations for passenger steamers. The upper-deck fittings are of teak, and the most modern appliances have been supplied for the efficient working of the ship and the rapid handling of cargo, with a complete installation of electric lighting throughout the vessel, and refrigerating machinery on the carbonic-anhydride system, with chambers of 7,700 cubic feet capacity for the transport of frozen meat, &c. Superior accommodation has been provided amidships for the first-class passengers, and as the ships are intended to trade to tropical climates the extra large and roomy staterooms have been placed on the upper-deck, which admits of perfect ventilation, and are furnished with all the latest improvements for the comfort of the passengers. Very comfortable accommodation has been supplied for 700 emigrants on the main deck with patent portable iron lattice berths and folding mess tables and seats, the hospitals, dispensary, &c., being in the poop; and the officers' quarters have had special consideration bestowed on them. The vessel is built with a cellular double bottom all fore and aft, and is constructed in accordance with the recommendations of the Bulkhead Committee, and the ventilating arrangements throughout the ship are exceptionally complete. The machinery consists of a set of triple-expansion engines, having cylinders 36 in., 42 in., and 70 in. by 4 ft. 6 in. stroke, with three steel boilers for a working pressure of 180 lbs., and fitted with the most modern appliances for efficiency and economy, including Howden's system of forced draught. The Royal Mail Co. were represented by Captain Jellicoe, one of the directors, and Mr. Arthur, the superintending engineer.

Queen Eleanor.—On August 15th a very satisfactory trial trip was made with the *Queen Eleanor*. She has been built by Messrs. Bartram & Sons, of Sunderland, for Messrs. Thomas Dunlop & Sons, Glasgow. She is classed 100 A1 at Lloyd's, and is of the spar-deck type, with poop, long bridge, and topgallant forecastle, and is of the following dimensions:—Length, 344 ft.; breadth, 45 ft.; depth, 28 ft. 9 in.; gross tonnage, 3,574 tons. The hull is divided by six watertight bulkheads, and the double bottom is on the cellular principle, divided into tanks capable of carrying an extra large quantity of water ballast. There are no hold beams, and the holds are particularly free from obstructions and very suitable for general cargoes. The deck machinery consists of five large steam winches and steam capstan windlass, driven from one of Riley Brothers' multitubular donkey boilers. The steering gear is placed at the after end of the engine-room, controlled from the flying bridge. There is also a hand gear aft, fitted with two large steering wheels. Messrs. Whyte, Thomson & Co. have supplied the sounding machine and compasses, including their patent standard compass, and also their patent electric log, whereby the captain is enabled to see at a glance in the chart-room the speed the vessel is travelling at. The saloon, chart-room, captain's cabin, &c., are elaborately finished in light oak, and were much admired by the numerous company on board. The engines and boilers have been made by Messrs. John Dickinson & Sons, Limited, and are fitted with every improvement, the principal of which are Howden's system of forced draught, Morrison's evaporator and feed heater, Kirkaldy's filter and fresh water condenser, duplex ballast and feed pumps, steam ash hoist, and steam turning gear. The vessel made several runs over a measured course, and attained a speed of 11¼ knots, which was considered very satisfactory. This is the eighth vessel built by them for this firm.

Lucania.—On August 18th a large party, on the invitation of Messrs. E. J. Williams & Co., Limited, embarked on board the steam trawler *Lucania*, when she made her trial trip. The *Lucania* is the largest steam trawler ever launched on the Humber or in the United Kingdom. She is 112 ft. between perpendiculars, and 120 ft. over all, 21 ft. beam, and 11 ft. 3 in. depth of hold. One of the latest improvements is a covered-in bridge, built of teak wood, with glass sliding windows. In fact, it is built after the principle of a railway carriage, and can be closed and opened at will. The compasses on the bridge are of Messrs. Parrots' latest, the compass, instead of being, as is usual, placed on a pole, is inserted in the ceiling of the bridge. She has a perfect electric light installation, having the light both at masthead and side-light houses. In all she is fitted with 30 lights. Her engines are Messrs. C. D. Holmes' 60 H.P. triple-expansion, and fitted with Morrison's patent evaporator and Royle's patent feed heater; Holmes' patent double-barrelled winches, with Sudron's patent centre bollards. The trawl is an "Otter," with Sudron's large-sized dandy scores for working the gear. The *Lucania* left the Corporation Pier, and steamed easily until outside the Spurn light, when she was put at full speed. The trial of speed was watched with great expectancy by both owners, builders, and guests, who crowded round the log, ticking on knot by knot in their note books until the hour was up, when it was found the log registered 10½. Mr. E. J. Williams, manager of the firm, gave his guests a treat by asking his captain, Mr. Just, late of the steam trawler *Campania*, to shoot the trawl. This operation was highly satisfactory, and gave evident pleasure to the company who witnessed the performance. The vessel's head was now turned towards home, and her owners, Messrs. E. J. Williams & Co., Limited, have every reason to be satisfied with the craft the builders, Messrs. Cochrane & Cooper, of Beverley, have built for them.

Princess of Wales.—On August 18th the paddle steamer *Princess of Wales*, built by Messrs. R. Craggs & Sons, of Middlesbrough, to the order of the Medway Steam Packet Co., Limited, went out from Middlesbrough on her trial trip. The vessel is 140 ft. in length by 18 ft. beam, and is intended for the passenger service between Rochester, Sheerness, and Southend. The engines, which are of the compound diagonal surface-condensing type, fitted with strong paddles with feathering floats, have been constructed and fitted on board by Messrs. Jameson & MacColl, of Sunderland. After adjusting compasses the vessel went for a short cruise, during which a speed of over 13 knots was obtained, the engines working at about 50 revolutions per minute without any signs of vibration or heating.

Pannonia.—On August 18th the *Pannonia*, a very finely modelled steel screw steamer, which has been built by Messrs. Wigham Richardson & Co. at their Neptune Works, Newcastle-on-Tyne, to the order of the Ungaro-Croata S.N. Co., of Fiume, went for a highly successful trial trip off the coast. The steamer is over 220 ft. in length by 29 ft. beam, she is rigged as a two-masted schooner, and has been built to obtain the highest classification at Lloyd's. Being intended for the transport of passengers and mails, she is specially arranged for that end. She has accommodation for 50 first-class passengers in a very handsomely finished saloon, and ladies' room on the upper deck and in staterooms both on the upper and main decks. Above the saloon is a spacious promenade deck, 150 ft. in length, containing a luxurious smoke-room. Forward of the first-class accommodation there is a saloon, &c., for the second-class passengers, and also accommodation for the crew. The requirements of the mail service have also received attention, there being suitable rooms for the mails, parcels post, &c. The first-class saloon is very well ventilated and capable of seating 50 persons, the walls are of polished sycamore, profusely ornamented with marqueterie panels, and the parquet floor is of polished oak. The ceiling is covered with Tynecastle canvas, tastefully painted and gilded, and the upholstery work is of blue Utrecht velvet. The smoke room is of polished oak, with carved panels, and the upholstery here is of old gold Utrecht velvet. The first-class state-rooms and ladies' room are all upholstered in maroon Utrecht velvet. The upholstery in the second-class accommodation is of red. The engines have also been constructed by Messrs. Wigham Richardson & Co., and consist of a set of self-balanced four-crank quadruple-expansion engines on the Yarrow, Schlick & Tweedy system. They worked during the whole of the trial trip in a most satisfactory manner, and the complete absence of vibration augured well for the comfort of the future passengers. The steamer attained a speed of 16 knots per hour. The steamer has been built for the mail and passenger service, which is carried on by the Ungaro-Croata S.N. Co. between Fiume and the various ports of Dalmatia. Owing to the lack of railway communication, the steamship service between these ports has been greatly developed, and by none more than by the company for whom the *Pannonia* has been built. This steamer is intended to run between Fiume, Zara, Spalato, Ragusa and Cattaro, the last named being the nearest point from which to pay a visit to the little capital of Montenegro. The round trip will occupy only three days, and during the greater part of the time the traveller is passing between islands where the water is smooth and the scenery superb. Besides the Ungaro-Croata S.N. Co., another powerful company has recently been formed to develop Dalmatia by the erection of palatial hotels and "cure-stations" at various points on the coast, and as the climate is exactly the same as that of the opposite coast of Italy, and is not surpassed by any part of Europe in loveliness, doubtless Dalmatia has a bright future before it. The company for whom the steamer has been built was represented on the trial trip by Mr. Sterk, one of their directors, and Captain Baccarcich, who will take command of the vessel, and Mr. Mouton, the engineer, were also present. The builders' firm were represented by Mr. Tweedy and Mr. J. Denham Christie.

Iona.—On August 20th the London and Edinburgh Shipping Co.'s steamer *Iona*, after being fitted with new boilers, and having her engines tripled, &c., went down the Firth of Forth on her trial trip, which was a great success. This vessel ran down past Dunbar, and the engines indicated 3,400 H.P. Two new boilers have been added, working up to a pressure of 180 lbs., and the engines have cylinders of 27 in., 45 in., and 75 in., by 48 in. stroke. It is expected that the vessel after running a bit will improve on her trial run. The *Iona* has received extensive alterations and improvements at the hands of Messrs. S. & H. Morton, shipbuilders, Leith, in order to make her more up to the requirements of the service in which she is employed—the passenger traffic of the company between Leith and London.

Trojan Prince.—The new screw steamer *Trojan Prince*, owned by the Prince Line, Limited, was lately taken on her trial trip off the Tyne. After the vessel had steamed along the coast in a northerly direction for some distance she was put on the measured mile and a speed of 14 knots was reached, which was deemed thoroughly satisfactory. The *Trojan Prince*, which was built by Messrs. John Readhead & Co., of South Shields, will be in future actively engaged in the company's River Plate regular service from Antwerp and London to the Brazils and back, calling at Madeira *en route*. She is a vessel somewhat similar in design and arrangement to the *Afghan Prince* and *Tartar Prince*, but of longer dimensions, on finer lines, and with heavier and more powerful engines. She has also much improved passenger accommodation. The vessel measures about 365 ft. long, and she will carry 5,000 tons on a moderate draught. An important feature for a vessel carrying passengers is the application of the double-bottom system, right fore-and-aft, with numerous watertight divisions. The engines are of the triple-exansion type of 2,500 I.H.P., supplied by two boilers, attached to which is Howden's system of forced draught. The *Tartar Prince* holds the River Plate record for speed, and the *Trojan Prince* has been designed and engined "to go one better," and still further to reduce the time. The vessel has been engined by Messrs. Readhead & Co. Captain Hesketh, late of the *Tartar Prince*, has the new command.

Luigia Premuda.—This steamer, built by the Campbeltown Shipbuilding Co., and engined by Messrs. John G. Kincaid & Co., went down the Clyde lately on her trial trip with a select party on board, including the Messrs. Premuda, of Lussinpiccolo, the owners, and their friends, also Mr. Dadd, their superintendent from London, the representatives of the British and Austrian Lloyds', Mr. Broom, of the Campbeltown Shipbuilding Co., and the Messrs. Kincaid. The vessel was tried on the measured mile at Skelmorlie, when an average speed of 11¾ knots was attained, the engines, which had only been started a few hours before leaving the dock, working with smoothness throughout. *Luigia Premuda* returned to the James Watt Dock to load a full cargo of coal prior to sailing for Trieste early this week.

Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—Ed. M. E.]

JOHNSON AND PHILLIPS' ARC LAMP.

To the Editor of The Marine Engineer.

Sir,—A contemporary, having made a statement to the effect that Brockie-Pell Arc Lamp, Limited, has been formed for the purpose of taking over part of our business, we shall be glad if, by the courtesy of the Editor of the Marine Engineer, we are allowed to inform our customers and friends that the company referred to leaves our business alone, taking over from us only Messrs. Brockie & Pell, in whom we cannot claim to have proprietary rights. We shall continue to manufacture our lamps as before, bestowing upon them that care in make and finish to which their great success in the past has been due. It may be difficult for experts to detect the difference between our lamp and that known up to the present as the "Brockie-Pell" but to our customers the difference will be apparent inasmuch as the price of ours will now be reduced by the amount hitherto paid in royalties.

We are,
Yours faithfully,
Johnson and Phillips.

Old Charlton, Kent,
August 4th, 1896.

Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships, from July 10th, to August, 6th, 1896.

15335 E. H. Holmes and W. B. Woodruff. Gauges.
15369 H. G. Hills. Spanners and wrenches.
15374 J. Pogson. Surface condensers.
15376 R. L. Barker. Metallic packings.
15385 D. Colville, jun. Manufacture of armour plates.
15418 A. Savage. Preventing boats being capsized.
15429 H. C. Ashlin. Steam generators.
15437 L. Gathmann. Instruments for use on vessels.
15464 H. A. Hill and T. E. Mitton. Reducing valves.
15469 J., H. S., and T. H. Spencer. Furnace.
15478 C. Tuckfield. Rotary engine.
15479 C. S. Snell. Submarine cable-laying appliances.
15481 J. Baxter. Metallic packing for glands.
15488 F. H. Haviland, A. Holloway, J. B. Collier and W. H. Murch. Furnace.
15549 T. Staples. Steel bridges for manholes.
15560 L. T. Darnault and V. Gevallos. Lifeboats.
15594 C. E. Starr. Steam gauge safety attachment.
15605 C. Hatton. Manufacture of weldless tubes.
15644 W. Fairweather. (H. Hechler, Germany.) Swimming and life-saving device.
15686 G. M. Hamlyn. Chocks for supporting boats.
15691 G. Cornish and W. A. Lloyd. Lever and clutch gear.
15716 J. M. Emptage. Trawl nets.
15773 W. J. Roberts and J. R. Jones. Utilising tidal power.
15778 E. A. Messinger. Water pumping apparatus.
15792 E. S. Cornish. Sounding the depth of water.
15839 J. Berron. Means for propelling row boats.
15885 W. H. James. Saving life at sea.
15900 W. Tharme. Propellers for ships.
15910 T. Moodie. Opening watertight bulkhead doors.
15961 R. J. White. Steam traps.
15963 C. Neuhaus. Protector for water-gauge glasses.
15976 J. Hopkinson. Stop valves.
15988 E. Butterworth. Internal combustion engines.
15991 A. Saul and J. Southworth. Safety valve and cylinder.
15998 L. Marshall and S. Naylor. Manhole door.
16002 E. W. Koster. Valve gear for force pumps.
16013 W. B. Cowles. Hydraulic systems for closing watertight bulkheads.
16015 A. Hunter and F. Jordan. Furnace doors.
16048 D. Morell. Rotary pumps.
16050 A. C. Reinhard (M. Mehlhardt, Germany). Covering for steam pipes.
16054 T. Armstrong. Ship propelling apparatus.
16061 J. Wagner. Furnaces.
16097 F. E. Shean. Preventing marine engines racing.
16101 W. H. Sharpe. Adjustable angle plate.
16123 J. R. Bennett. Engine cylinders.
16142 A. J. Boult (The Rochester Automatic Lubricator Co., United States). Lubricators.
16174 F. Panoux. Valve gear for steam engines.
16179 S. P. Hyatt. Automatic cut-off valve gear.
16180 J. B. Torres. Refining iron and steel, &c.
16206 J. Stuckley and G. Holden. Steam engines.
16265 T. Hughes and W. E. Millett. Valves.
16282 C. B. Kilby. Draw plates for fire grates.
16300 J. C. Margetson. Varying speed in motors.
16314 A. W. Southey. Internal combustion engines.
16334 A. Howard. Engine.
16335 J. C. Margetson. Motors.
16364 H. Ellis. Machine belting.
16371 H. W. Asher. Screw water-tube propeller.
16393 M. Robinson. Recording the transmission of power.
16407 C. A. Baker. Engine-room telegraph, &c.
16412 W. James. Valves for hydraulic apparatus.
16423 J. Formby. Screw propulsion of vessels.
16434 P. E. Singer. Engines.
16454 B. Kahl. Rotary engines.
16455 B. Kahl. Water-tube steam generators.
16458 W. Sisson. Brasses for connecting-rods.
16459 W. Sisson. Fluid for crank-shaft engines.
16464 A. J. Boult (K. Henschel, Germany). Reciprocating engines.
16468 H. F. Fourny. Shoes for trawl otter boards.
16469 W. McG. Greaves. Seating blocks for steam boilers.
16485 D. Colville, junr. Making composite armour plates.
16492 R. Elliott. Water-tube boilers.
16493 P. J. S. Harlow. Spanner or wrench.
16506 W. Whitehead. Speed varying gears.
16504 G. W. Eldridge. Instrument for indicating the trim of a vessel.
16521 A. F. Yarrow. Regulating steam boiler feed.
16538 W. Green. Navigable craft.
16548 F. W. Zimer. Entering pleasure boats.
16572 J. Murray. Valves.
16574 F. Grube. Boiler heating.
16581 J. Corp. Bolts.
16590 F. J. Talbot and W. Clarke. Rod couplings.
16603 C. F. W. A. Foche. Cleaning iron and steel.

16608	J. D. M. Blain. Compasses.
16610	W. T. Lord. Boats' oars.
16633	J. Fielding. Cylinders for engines.
16659	J. Foster. Steam vapour condenser, &c.
16668	E. B. Fenby. Cooling engine cylinders.
16673	H. F. Fourny. Otter trawl boards.
16687	J. Griffin. Device for releasing ships' boats.
16693	G. H. O. Rose. Closing watertight doors.
16694	E. A. MacLachlan. Boat propelling apparatus.
16707	C. H. Berry and J. Snowdon, jun. Lubricating apparatus.
16718	H. H. Lake (H. R. Fay, United States.) Valves for steam engines.
16745	D. J. Crosby. Connecting rods for pumps.
16755	E. J. Campion. Lights for sea-going vessels.
16781	W. P. Fox. Water-pressure motors.
16789	J. B. Howard (J. Eckhardt & Son, Germany). Ship propelling apparatus.
16792	W. G. Wrench. Screw propellers.
16817	T. Child. Device for cleaning ships' hulls.
16842	W. H. Wilson and W. J. Pirrie. Water-tight doors.
16856	H. Lindley. Shaft governors.
16857	J. Danby. Non-conducting composition.
16880	W. Dalton. Boiler tubes with concentric supports.
16896	D. Macaulay. Motive power engines.
16898	J. Lewis. Sole plate for trawl gearing.
16921	F. Sheppard. Steam engines.
16950	C. A. Allison (D. E. Powers, United States). Rotary engine.
16956	W. F. Suddaby and The Leeds Forge Co. Steam boiler furnaces.
16974	T. Don, jun. Doors for bulkheads of ships.
16985	E. J. Duff. Utilising steam from engines.
17046	E. A. S. MacMunn. Propelling apparatus.
17072	J. R. Scott. Trawl nets.
17087	W. Ramsell. Steam engine reversing gear.
17090	A. Anthony. Cranks.
17091	Tangyes Limited and E. Barnes. Pumping engines.
17100	B. Leslie. Securing boats on board ship.
17118	F. W. Klever. Lubricants.
17129	A. A. Loyal. Improved friction driving gear.
17136	O. Trossin. Steam turbine.
17140	T. Manwell. Torpedo indicating lights.
17142	W. H. Dorman. Accumulators.
17149	D. N. Bertram and S. Milne. Speed gearing.
17155	F. B. Parkinson. Supplying water to boilers.
17160	E. Towlson. Pumps.
17169	T. Moodie. Apparatus for closing bulkhead doors.
17188	J. D. Mark. Propellers.
17211	J. C. Etchells. Oil engines or motors.
17212	J. C. Etchells. Oil engines or motors.
17215	A. I. Bailey. Joint or couplings for rods.
17267	H. M. Nicholls. Steam engine and pumps.
17280	J. E. Schumacher, T. E. Pickering, A. Whittam, and G. W. Tindall. Steam, &c., engines.
17294	F. H. Larnder. Method of propelling boats.
17295	W. Andrew. Means for storing ship's boats.
17305	F. Albin and S. Stubbs. Valves for steam generators.
17309	A., J. A., F. E., and M. E. Normand. Feed-water regulator.
17329	A. Freeman and F. Freeman. Rotary engine.
17337	T. Myers. Engine reversing appliances.
17358	E. Makin, jun. Steam generators
17365	D. J. Morgan. Manufacture of furnace fire-bars.

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EXTRA FIRST CLASS.

August 1st, 1896.	Pryce-Brown, P.	Ex. 1C	London
July 25th, ,,	Robertson, T.	Ex. 1C	Leith
August 1st, ,,	Young, J. H.	Ex. 1C	Glasgow

NOTE.—1C denotes First Class; 2C, Second Class.

July 25th, 1896.

Anderson, J.	1C	W.H'pool
Anderson, J.	2C	Dundee
Baird, W. J.	2C	W.H'pool
Baker, H.	2C	S.Shields
Brown, J. F.	2C	W.H'pool
Crocker, A.	1C	Cardiff
Cruickshank, J.	2C	Aberdeen
Davison, F. N.	2C	S.Shields
Dring, F.	1C	W.H'pool
Dunn, G.	2C	Dundee
Eider, W.	2C	Liverpool
Evans, T.	1C	Cardiff
Finnis, W. S.	2C	London
Fraser, W.	1C	Aberdeen
Gillespie, J.	2C	Glasgow
Guyan, W.H.W.	2C	,,
Harley, J.	2C	,,
Harris, J. D.	2C	London
Higgins, A. P.	2C	W.H'pool
Hunter, E. L.	1C	,,
John, D.	2C	Cardiff
Kirk, T.	2C	W.H'pool
Mansfield, J. F.	2C	London
Marcussen, M.	2C	Glasgow
Martell, W.	2C	London
McCall, W.	2C	Glasgow
McCallum, L.H.	1C	,,
McKinlay, A.	1C	Cardiff
McLay, J.	2C	London
McMillan, W.G.	2C	Glasgow
Oliver, G. W.	2C	Cardiff
Peden, W. E.	1C	Glasgow
Pounder, J.	2C	W.H'pool
Roberts, T.	1C	Cardiff
Robertson, A.	1C	Glasgow
Rolland, G. H.	1C	,,
Shearer, J.	1C	,,
Smart, D. M.	1C	Dundee
Thompson, A.E.	2C	S.Shields
Tulip, T.	2C	Bristol
Turnbull, J. H.	2C	Liverpool
Walker, J. T.	2C	W.H'pool
Wallace, T.	2C	Glasgow
Watson, D.	1C	,,
Weller, H. W.	2C	London
Witten, R. A.	1C	W.H'pool
Yuill, M.	1C	Glasgow

August 1st, 1896.

Adams, Thomas	2C	Liverpool
Addison, W. L.	2C	,,
Allen, A. S.	2C	Hull
Bridges, G.E.D.	2C	S'nd'land
Chisholm, C. J.	2C	London
Dowse, W. A.	2C	N.Shields
Ferguson, J.	2C	London
Goodfellow, A.	2C	N.Shields
Graham, J. W.	1C	S'nd'land
Hall, R. B.	2C	,,
Iles, P.	2C	,,
Jackson, E. L.	1C	Hull
Lapish, F. W.	1C	,,
Mackenzie, P.	1C	London
Marsden, J. H.	1C	,,
Reader, J. V.	2C	,,
Richardson, C.	2C	N.Shields
Robinson, T. T.	2C	Hull
Robson, J.	2C	S'nd'land
Sergeant, F. S.	2C	London
Swaine, J.	1C	S'nd'land
Wilford, S.M.	2C	,,
Wood, J.	1C	London

August 8th, 1896.

Adam, T.	2C	Liverpool
Addison, W. L.	2C	,,
Allan, T. A.	2C	N.Shields
Brough, J.	2C	Glasgow
Clark, T. S.	2C	Cardiff
Collard, H. J.	1C	London
Cross, A. K.	2C	Glasgow
Dixon, E. P.	2C	N.Shields
Fullarton, J.	2C	Glasgow
Garnett, A. H.	1C	London
George, F. G.	1C	Cardiff
Goudie, G.	2C	N.Shields
Harris, F. W.	2C	London
Howie, W. H.	1C	Glasgow
Jeffrey, S. J.	1C	London
Keigwin, E. C.	2C	Cardiff
Lewthwaite, G.	1C	N.Shields
Macindoe, A. E.	1C	Glasgow
Marshall, F. G.	1C	London
Millican, J. A.	1C	N.Shields
M'Leod, J.	2C	Liverpool
Neill, A. J.	1C	London
Parsons, A. R.	2C	Liverpool
Porter, M. W.	2C	Hull
Reid, A.	2C	Leith
Sallanoe, A.	1C	Glasgow
Saxelby, H. R.	2C	London
Soulsby, Ernest	2C	Hull
Stockley, C. R.	1C	N.Shields
Styles, J. A.	2C	Cardiff
Thomas J.	1C	London
Torrance, C.	2C	Glasgow
Wilson, A.	2C	,,
Wilson, J.	1C	,,

August 15th, 1896.

Ballantine, J.	2C	Dundee
Blevins, T.	2C	London
Brown, J.	2C	Greenock
Cochrane, F. S.	2C	Liverpool
Hall, C. P.	2C	London
Haynes, F. G.	2C	,,
Hicks, C. K.	1C	Liverpool
Jones, W.	2C	,,
McNeill, G.	1C	Greenock
Mair, W.	2C	London
Menmuir, C.	1C	Greenock
M'Hardy, J. D.	2C	Liverpool
McKenzie, J.	1C	Greenock
M'Leod, J.	2C	Liverpool
Neil, T. N.	1C	,,
Parsons, A. A.	2C	,,
Rennie, J. C.	1C	,,
Rule, W. J.	1C	,,
Stevenson, J.	2C	Greenock
Stokel, A. W.	2C	London
Tully, W. N.	2C	Liverpool
Tweedlie, R.	1C	Greenock
Wallace, J.	1C	London
Whelan, E.	1C	Liverpool
White, P. T.	2C	,,
White, T. H.	2C	London
Widdows, H. P.	2C	,,

August 22nd, 1896.

Alderson, J.	2C	W.H'pool
Baillie, R.	2C	London
Blay, A.	1C	,,
Braxton, P.	2C	W.H'pool
Cameron, W. R.	2C	Aberdeen
Cloke, S.	2C	W.H'pool
Coon, G. S.	2C	London
Crawsthorne, W.	2C	Liverpool
Doran, T. J.	2C	London
Douglas, J.	2C	Glasgow
Evans, E. D.	1C	London
Fahy, W.	2C	W.H'pool
Forbes, J.	1C	Liverpool
Galbraith, W.	2C	,,
Gay, A. E.	2C	London
Hall, T. W.	2C	W.H'pool
Hamilton, J.	2C	Liverpool
Hunter, W.	2C	Cardiff
Jack, J.	2C	Aberdeen
Johnston, P. J.	2C	Cardiff
Lee, H.	2C	London
Love, J.	1C	Glasgow
Martin, R.	2C	Liverpool
McKenzie, J.C.S.	2C	London
McLeod, T.	2C	W.H'pool
Mitchell, T.S.	2C	Glasgow
Pilbim, E.	2C	N.Shields
Potts, T.	2C	,,
Sheriff, J. M.	2C	Glasgow
Steel, J.	1C	London
Tyzack, H. F.	1C	N.Shields

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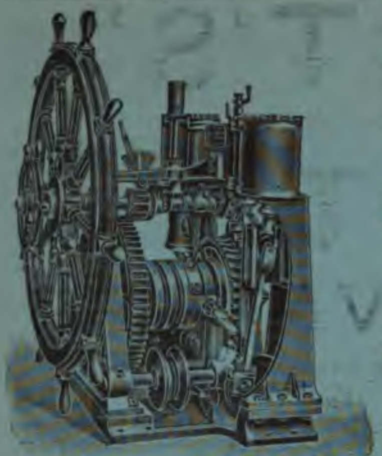

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MARINE ENGINEERS

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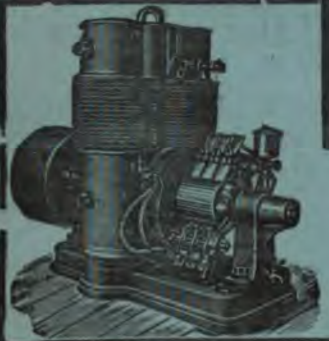

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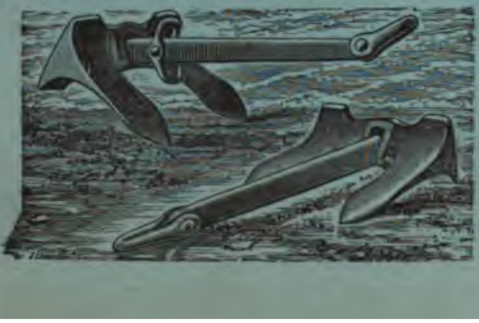

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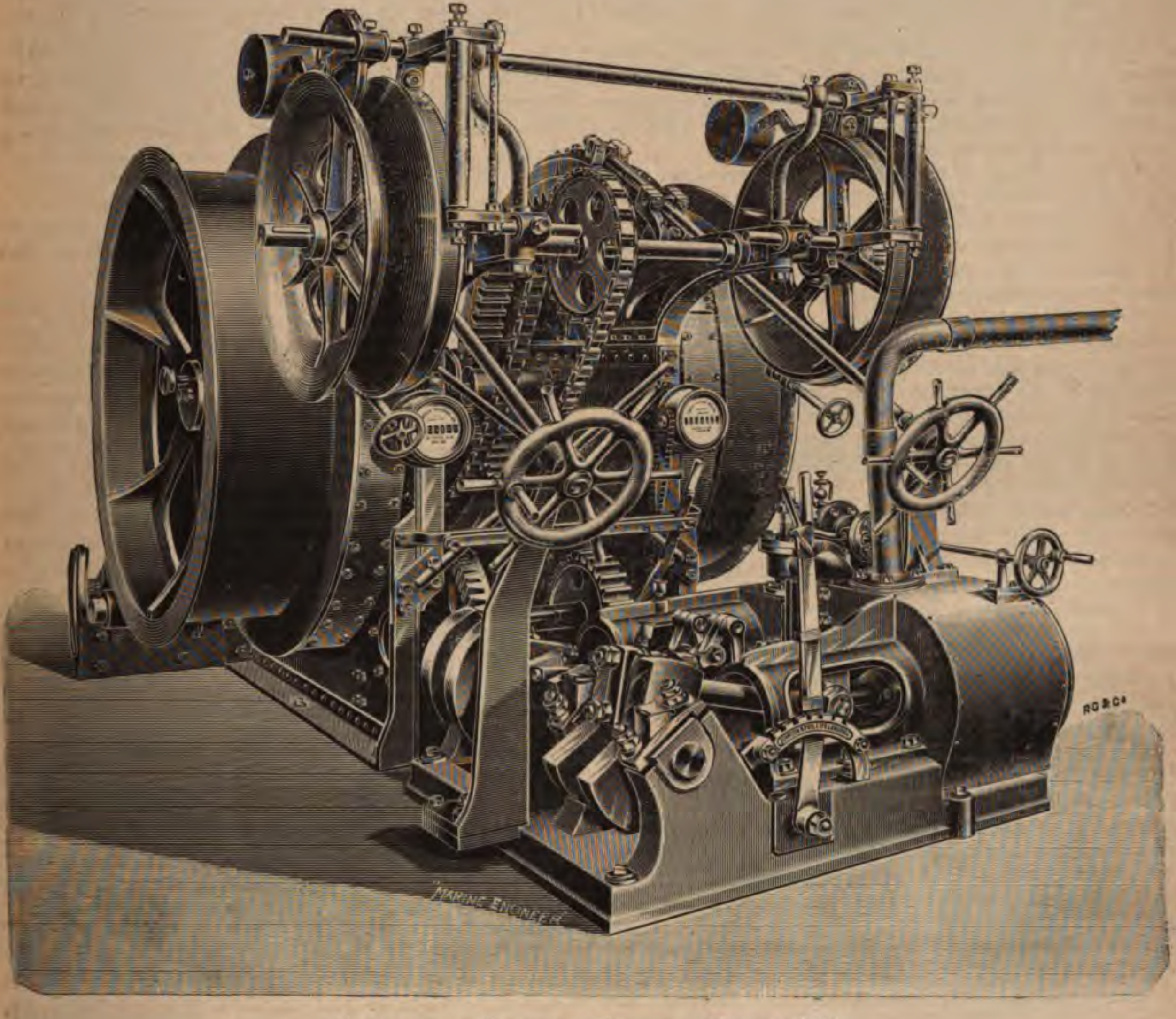
The Marine Engineer.

LONDON, OCTOBER 1, 1896.

SOUTHAMPTON has been honoured by the meeting there of the Association of Chambers of Commerce of the United Kingdom, and the meeting was utilized by the Association to once more press upon the Government the necessity of providing an adequate Royal Naval Reserve. The part taken by the Association in the passing of the Naval Defence Act is well known to their credit, and now that a large addition of ships has been made to the Navy, they are prepared to follow up their first success by being the mouthpiece of the nation to insist upon adequate additions to the Naval Reserve, to properly man those ships. A formal resolution to that effect was duly passed, and Lord Charles Beresford, in seconding the resolution, again gave full expression to his views as to the inadequate supply of men at present, even for the ships now built and building, without regard to the 46 vessels of the 70 provided by the Defence Act, that still have to be built. Lord Charles complimented the various Chambers of Commerce of London and Liverpool, as to the active part they had taken in impressing upon the Admiralty the urgent necessity for increased means of Naval Defence, and that the nation at large were quite prepared to pay for such extension, and now they were completing their good work by insisting upon an organised supply of men, to man the fleet efficiently. Lord Charles does not hesitate to say that the First Lord of the Admiralty is self-deceived to the extent of 10,000 men, in his estimates of men available, as such estimates include 5,000 boys, clerks at the Admiralty, naval cadets, &c., who were not available for service in the Fleet. The first Lord apparently admits hat he is short at the present time of 11,000 men to man all possible ships, and if this admitted deficiency be added to the estimated "paper men," pointed out by Lord Charles Beresford, the deficiency appears to be about 20,000 men. Lord Charles, therefore, advocates a complete change of system, and the formation of a trained Reserve of not less than 70,000 men, who could be called upon to oin the Navy without depleting the Mercantile Marine of its best men. It is hardly likely that the old system of impressing from the Mercantile Marine can ever be revived, or that seamen so impressed would be of any value, for at least a year or more, in the complicated mechanisms now constituting our iron-clad Navy. The nation must be prepared then to pay for the willing call of such services when required, and that the services when called shall be sufficiently trained to be of immediate value. This can only be effected by short service, and a trained Reserve retained during peace at a fractional pay, as in the Army. We think this scheme is likely to work out better for the men than the Army Reserve, as the Reserve seamen would have no difficulty in obtaining adequate civil employment in their own profession, and would probably be much sought after as men accustomed to discipline, of good character and excellent seamen. Owing to their Reserve bounty they would thus supply a most valuable supply of best trained British sailors, who could afford to engage their services in civil employment as seamen, at a price that would compete with the very various nationalities who now throng the Mercantile Marine, and would doubtless at a fair wage be much preferred to foreigners. The British Naval officer might object at first to the constant succession of raw seamen that would follow from short service, but when the urgent need of such a Reserve is seen, the British naval officers may be depended upon to sink their personal convenience for the good of the nation. The Hon. T. G. Brassey contributes his quota to this subject through the medium of the Daily Press, pointing out that we have almost inexhaustible resources for the formation of an efficient and trained Naval Reserve in the fishing and seafaring population of Canada and Australasia, who would doubtless be well pleased to serve six months or a year in Britain's Navy, and to retire to their former occupations with the honour and solid comfort of a Reserve annuity. This scheme would form Reserves of seamen of excellent efficiency, in all our maritime colonies, and would further aid in knitting together the interests of our colonies with that of Great Britain, as one glorious Empire. This would be a step to the amalgamation of our colonial navies with that of the mother country, with equal rating and professional standing, and would be one of the best steps towards Imperial Federation.

THE collapse of the dispute upon the Clyde without a serious strike is probably a matter for congratulation, both to masters and men especially interested, and to the nation at large. The comfort and general wealth of a nation is in direct proportion to its steady producing or manufacturing capacity, and the averting of a partial stop in the producing capacity of so important an industry as marine engineering is a gain to the nation at large. Were we, as a producing or manufacturing nation, alone, or without rivals in the world, we could afford to contemplate with equanimity the cost and succession of strikes in all trades, where the respective interests of capital and labour must sometimes clash; but the general damage to the nation at large is much more affected by the disturbance of trade and contracts, and their consequent diversion to our energetic foreign rivals, who fully utilize such opportunities to pick up our disgusted customers, than by the damage done by the strikers to their own pockets and those of their direct employers. We have no doubt that though there is considerable hardship to be borne by the working classes during such conflicts, the workmen somewhat enjoy their entire cessation from labour, and the excitement of the struggle. Similarly, the employer can get off their accumulated stocks, can thoroughly overhaul their plant and boilers, and get them into first-class condition for resumption of work; which thorough overhauling they might never have had the opportunity to effect had work continued in ceaseless round. The inconvenience and loss also occasioned by such strikes bring home to the employers the necessity of being independent, as far as possible, of the caprices of labour, and they thus receive a particular spur towards the invention of labour-saving appliances, or the substitution of unskilled labour with perfected machinery, for pure handicraft skill, which proves to be unmanageable. The introduction of all revolutions of trade by the substitution of machinery for handicraft skill has been forced on by labour troubles, and the workmen thus cut off their noses to spite their faces. We doubt whether workmen, as a class, will ever be brought to see this: that the reserved power to combine and stop production in face of unjust tyranny and grinding down by employers, is an enormous boon to their class, but that the active exertion of such power has, by its very fulfilment, destroyed its value, and results only in an industrial loss, both to the striker, the employer and the nation. Strikes are now so constant in one trade or another that we have no doubt that they represent a very regular percentage of enforced stoppage of production in every year; just as if employers and employed were obliged, by a higher controlling power, to actually desist from production for a stated period in each year. We wonder what the working classes would say if it was put to them in that way—that each trade, for instance, was obliged to strike or stop production, say for two months in every two or three years? We have no doubt statistics could be used to define almost definitely what such average of enforced stoppage at present amounts to in any trade by the wilful action of the employés. Employers should provide for this during active seasons, as a certainty to be covered by an insurance, and the working classes practically do the same by banding in unions and subscribing part of their hard-earned wage during activity. We think they might as well have their holiday without the quarrel, and, by due notice, might save their trade much of its diversions into foreign hands. That strikes have ever effected for the working classes an important or permanent increase of remuneration all facts disprove. The relative average range of remuneration is always decided by the state of trade and the purchasing power of customers, and last, but most important, by the appreciation or depreciation of gold relatively to labour; but we are afraid that the working classes will never have sufficient education or far-sightedness to see this. So many of them also love a row now and then, and capital and labour can no more, we fear, live together in monotonous harmony than other wedded couples do. We must therefore be glad of the passing of the threatened storm.

DR. FRANCIS ELGAR has been enlightening the British public at the Philharmonic Hall, in Liverpool, upon the progress of safety in ships during the last quarter of a century. It was Professor Rankine and other collaborateurs, who did so much by theorizing upon the stability of ships, stream lines and the action of waves upon a floating structure, that have enabled the practical constructors and the Surveying Bodies to increase so largely the safety of ships. It was the proud boast of one Liverpool company that they had never lost the life of a passenger through any fault in their ships; and with cargo steamers, it is the chief object of good owners to make them as safe as possible against the risks and the trying conditions under which the transport of goods must be carried on, if it was to be kept in British hands. Notwithstanding the increased demands constantly being made in the keen competition for trade, upon the carrying power of ships, the losses of British ships and of those in them at sea has been continuously and materially diminishing during recent years, and the increase in safety of all classes of ships is still going on. The conditions of safety now generally recognized, are the height of the upper deck, the range of stability and structural strength, and the circumstances affecting them. Vessels are now much less often lost through instability; and when such losses happen, it is to the stowage of cargo we usually require to look for the cause. No shipowner has any difficulty nowadays in obtaining information as to the precautions required in carrying any description of cargo to prevent the stability from being dangerously reduced; and when that is known, it is only necessary to effectually secure the cargo against shifting at sea. The structural strength of a ship is beyond all question if she be built to Lloyd's rules, or by any good ship constructor. One former frequent source of danger in the earlier steamships was the weakness of deck-houses, and inefficient protection of the deck openings against the battering effect of a heavy sea; but all this has now been altered by better knowledge as to the strength required, which, combined with the height of decks above water, prevents the overwhelming by the sea. One of the main lessons taught by a study of the statistics of losses, is the necessity of endeavouring to make ships as safe as possible by internal watertight sub-division in the event of injury by collision or stranding. There appears to be no reason why passenger steamers should not be so sub-divided by watertight bulkheads as to make them safe from any single blow from outside, and this is generally the case. In cargo vessels, however, this is difficult to effect without, at the same time, making them valueless commercially for trading purposes, as competition for the carrying trade is so keen, whilst foreign vessels are allowed to load as deeply and work as cheaply as possible. It is to be hoped that such conditions, where they reduce the safety of the vessel, will not long be allowed, even amongst foreign nations, and the general safety of vessels afloat will be thus improved. It is curious that sailing vessels are at present constructed so as entirely to disregard the added safety of watertight bulkheads, but better conditions may be hoped for hereafter.



Picking-up and Paying-out Machine. (*See page* 276.)

At Cherbourg, plant of the Thomson-Houston type, for the electric annealing of armour plates is about to be put down for the French Government.

Messrs. Thomas Shanks & Co., Union Works, Johnstone, are completing an overhead travelling crane of 100 tons lifting capacity, with a span of 65 ft., for Messrs. Wm. Beardmore & Co., Parkhead Forge, where it will serve the Titantic forging press, of 12,000 tons capacity, now being laid down there.

S.S. "TUTANEKAI," FOR THE NEW ZEALAND GOVERNMENT.

THE above-named vessel, the trial trip of which we gave in our August issue, was built for the owners by Messrs. Dunlop & Co., of Port-Glasgow, is designed for several purposes, the most important of which is the repairing of the New Zealand Government cables, and Messrs. Johnson & Phillips, of Charlton, who have had such large experience in machinery for this work, were entrusted with the complete outfit of apparatus, accessories and stores for this purpose.

A novelty in the design of all the deck cable machinery and fittings is that it can all be easily removed, so that when the ship is not required for cable purposes the whole of it can be taken away and be put into store, leaving the decks free.

All the holding-down bolt holes are provided with sockets into which plugs can be screwed, so as to leave the deck perfectly watertight when the gear is removed.

The picking-up and paying-out machine which we illustrate is extremely compact, though it is a double machine and is designed to pick up cables under a strain of 20 tons, it only weighs 9¼ tons, and occupies a deck space of 8 ft. 3 in. by 11 ft. 6 in. It is very similar in design to the gear recently fitted by Messrs. Johnson & Phillips on the Japanese Government steamer, except that it is not quite so powerful and has horizontal engines instead of vertical. The machine is built on two frames made of steel plates, with steel angles inside and outside, with welded corners. The drum shaft, which has large collars welded on for attachment to the frame, ties them well at the top. The forward bottom ends are tied by a steel plate and also by a flange shaft, which carries the fleeting knives and takes the eyes of the main brake straps. There is also a "T" bar stay at the bottom after end, as well as diagonal stays at each end of the pairs frames, thus making a very stiff job and allowing of the whole of this part of the gear being lifted out in one piece without fear of the shafts or bearings getting out of line.

The machine is designed for two speeds, which can be geared on to either drum, but the port drum only is intended for the heavy lift of twenty tons, for which purpose it is built in steel, whereas the starboard drum is of cast iron. These drums are 6 ft. 7 in. diameter by 2 ft. wide over all. They are internally geared and have a rim cast on for main brake, and so combine main drum, brake drum, and gear wheel. These drums are arranged to run loose on the shaft and are capable of many combinations with the gearing as follows:—Both drums can work loose without the engine. Both drums can work at the same speed with the engine. One drum can be driven by engine while the other runs independently. One drum can be held by brake while the other is being worked by engine. Power of both brakes can be put on to one drum by keeping the pinions in gear.

All wheels are arranged to draw out of gear where possible when not required for driving, so as to avoid rattling. In the case of the pinion which gears with large drums this necessitated cutting large holes in the frames, so that the pinion could pass right through them. The frames at these parts are provided with large circular cast iron pockets, which carry bearings at each end, so that when the pinion is in work it is close up to a bearing, thus ensuring a very sound job. The brakes consist of steel straps with elm blocks attached, the ends of the straps being fitted with steel castings, which carry nuts with right and left hand threads to take the brake screws. The screws and rods are taken down to the after end of the machine so as to be worked from the main deck. The lower part of the brake strap is fitted with a large cast iron eye, which transmits the strain to the lower part of the machine frames by means of a steel shaft, which is secured to the frames by large cast iron flanges.

Hauling-off gear is driven by a chain from intermediate shaft, so that its speed is always proportionate to that of the drums. For holding back purposes the sheaves have a brake rim cast on them, and on these rims a steel strap with screw adjustment is fitted, so that the amount of "drag" put on the cable can be adjusted minutely. The sheaves can slide along on their shaft to suit an inside or outside lead.

A small Worthington pump is fixed between the frames to supply the main and holding back gear brakes.

The engine has cylinders 9 in. and 16 in. by 10 in. stroke, suitable for steam 160 lbs. per square inch, and it is complete with automatic bye-pass valve, steam valve, and link motion reversing gear, all of which with the main and holding back brakes are within reach of one man at the after end of the machine. The gear was run under steam pressure at Messrs. Johnson & Phillips's works, and also on board the vessel to the satisfaction of the consulting engineers, W. H. Preece, Esq., and W. R. Culley, Esq., of H.M.T.S. *Alert*. The bow gear consists of two steel sheaves 3 ft. 2½ in. diameter by 11½ in. wide, which run loose on a steel shaft supported in cast iron brackets attached to three steel girders. Each sheave is provided with whisker guards to prevent the cable getting off the sheave, these guards also being bolted securely to the whiskers. The girders are fitted with eyes and bollards to secure the stoppers. A davit is provided between the sheaves for launching mushrooms, &c., and is arranged to fold down out of the way when necessary to let go the bight.

The vessel is fitted with the usual dyamometers, lead wheels, deck leads, troughing, &c., and is fully equipped with a complete outfit of stores and accessories, including grapnel and buoy ropes, grapnels, mushrooms, buoys, chains, sounding shot, steam sounding machine, steam hauling gear, &c., and the testing-room is provided with a set of first-class instruments.

BEVER'S PATENT DUPLEX PUMPING ENGINE.

WE illustrate in the adjoining diagrams a duplex pump, with a form of valve-gear which is very ingenious and has some very good features.

The ordinary duplex pump is so well known that it is hardly necessary to describe the working of the valve-gear, but we would point out that after one piston has completed its stroke, it has to wait until the other piston has made about seven-tenths of its stroke before it can move again for the return stroke, and during the whole of this time the full steam pressure is still acting on the piston, although it is at a standstill. In consequence of this condition of things the speed of the pump is limited, and for all practical purposes, only one piston is moving at a time. It is obvious that a considerable waste of steam must occur during the time that the steam is acting on the piston whilst it is stationary.

The Bever pump, a perspective view of which is shown in Fig. 1, a side elevation in Fig. 2, and a plan in Fig. 3, has steam cylinders of 7 in. diameter, water cylinders of 5 in. diameter and 10 in. stroke, and is capable of delivering 18,650 gallons per hour. This pump is made in all sizes up to a capacity of 2,000 gallons a minute and more, but the particular one illustrated is of the size given.

As will be seen from the illustrations, the difficulties which obtain with the ordinary duplex pump are obviated by giving the valve of each steam cylinder a compound motion, which is a combination of the movements of the two piston rods. This motion is obtained by coupling both the swinging levers from the cross heads to a vibrating lever in such a manner as to combine the two motions in the proper proportions. By reference to Fig. 3 it will be seen that the piston-rod A works the lever C, and the piston-rod B works the lever D. The ordinary gear for duplex pumps, of course, would be connected respectively with the valve spindles, *b* and *a*, but in this gear the connection is made through a vibrating lever E, which is attached to both valve spindles, and thus gives to each one a motion which is a combination of the motions of both the piston rods.

The object of this arrangement is firstly, to cut off the steam in each cylinder before the piston reaches the end of its stroke; and secondly, to give the slide-valves lead so as to prevent them striking the cylinder ends, and to cause them to make the return stroke with only just sufficient pause at the end of the stroke to allow the water valves to seat themselves.

Further, this lead has the very important function of starting the pistons very much more quickly on their return stroke, thus enabling the engine to perform a very much greater number of strokes per minute with the same speed of piston, and as each piston gives its own lead, it will always make the same length of stroke, instead of making short strokes, as the ordinary duplex pumps do. It is claimed by the manufacturers, Messrs. Bever & Dorling, of Dewsbury Foundry, Dewsbury, that these improved pumps have a very much larger pumping capacity, use less steam, and work more regularly than the ordinary duplex pump.

We think that the novelty is a distinct step in the right direction, and await with interest the results from extended trials.

We understand that these pumps have been run up to 180 double strokes per minute, which is equivalent to 180 revolutions per minute if they were coupled to crank shaft, without the slightest difficulty or drawback whatever. For pumping against high pressures the pumps are fitted with plungers, and the engines are made compound and condensing, and for all duties and purposes.

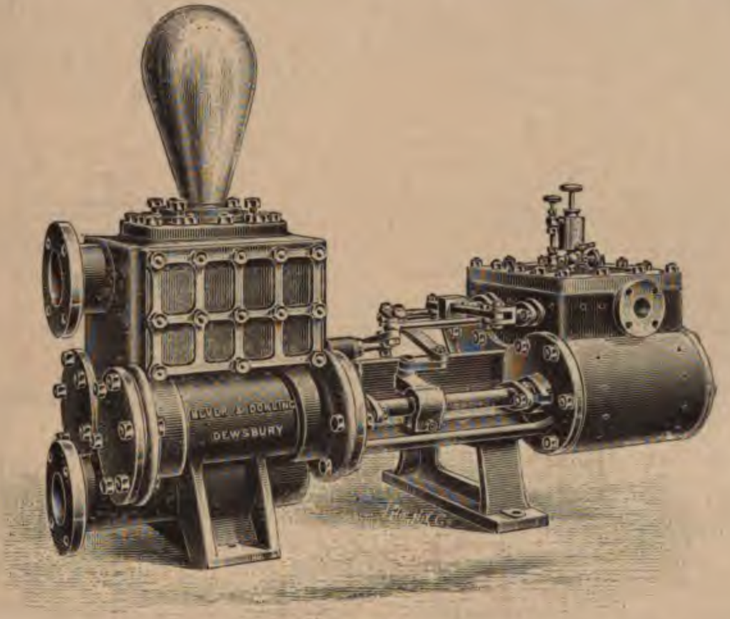


FIG. 1.

BEVER'S PATENT DUPLEX PUMPING ENGINE. (*See page 276.*)

THE FLEETS OF THE MAIL LINES.

(*From our own Correspondent.*)

Retiring from the Passenger Business.

A FIRM of upwards of thirty years' standing in the passenger trade is making preparations for giving up that part of its business. This is the old and successful Blue Funnel Line, which, under the management of Mr. Alfred Holt, has been so successful in its undertakings, although it has carefully eschewed the beaten path of its compeers. During the Japanese-Chinese war a large number of its older steamers were disposed of, naturally on very advantageous terms, and it is now replacing them with more modern vessels, which are not fitted for the carrying of passengers other than pilgrims. It has therefore no intention of, in any way, curtailing the other branches of its business. It was this line which, in the early days of expansive working, obtained great economy of fuel, a thing much to be aimed at in the Eastern Seas where coal is so dear, by its arrangement of a compound tandem engine driving a single crank, with a fly-wheel on the shaft. An example of this class of engine could be seen in the famous steam yacht, *Palais Royal*, which, before she was purchased by "the man who broke the bank at Monte Carlo" was for many years owned by the Blue Funnel Line. Mr. Holt, it is said, would never admit the use of a patent log aboard any of his vessels, and in other ways was wont to eschew new-fangled ideas. There are, of course, many patents which are of the most excellent and valuable character. But it may be doubted if the old instruments of navigation, which needed time and labour for their use, but which, if properly used, were practically infallible, were not really less like to lead to disaster than some of the elaborate new inventions which are being advertised and pushed in season and out of season, and which may in the hour of danger, fail without warning and prove to be mere pitfalls for the too confiding navigator.

The same company has since purchased the Shaw-Savill & Albion Company's s.s. *Tainui*, a very fine vessel of over five thousand tons, built twelve years ago by Messrs. Denny, of Dumbarton. She has triple-expansion engines and was one of the finest vessels in the New Zealand trade. Another purchase has been the old *Gallia*, to whom I make a reference elsewhere in the present instalment of Notes.

A New Consulting Naval Architect

has established himself in Liverpool within the last few days. This is Mr. George R. Brace, who for many years has been at the head of the drawing office in Messrs. Denny's yard at Dumbarton. He has now determined to start business on his own account, and is opening an office as a consulting naval architect and surveyor at Liverpool, whilst he is also agent for certain well known specialities. A man of Mr. Brace's experience should do well in Liverpool. He has been trained in a good school, and has had experience of good work of every class. In spite of the fact that there are other gentlemen engaged in the same profession in Liverpool it seems a wise choice to fix on the port on the Mersey. There ought to be plenty there to occupy a man of Mr. Brace's superior attainments and pleasant address.

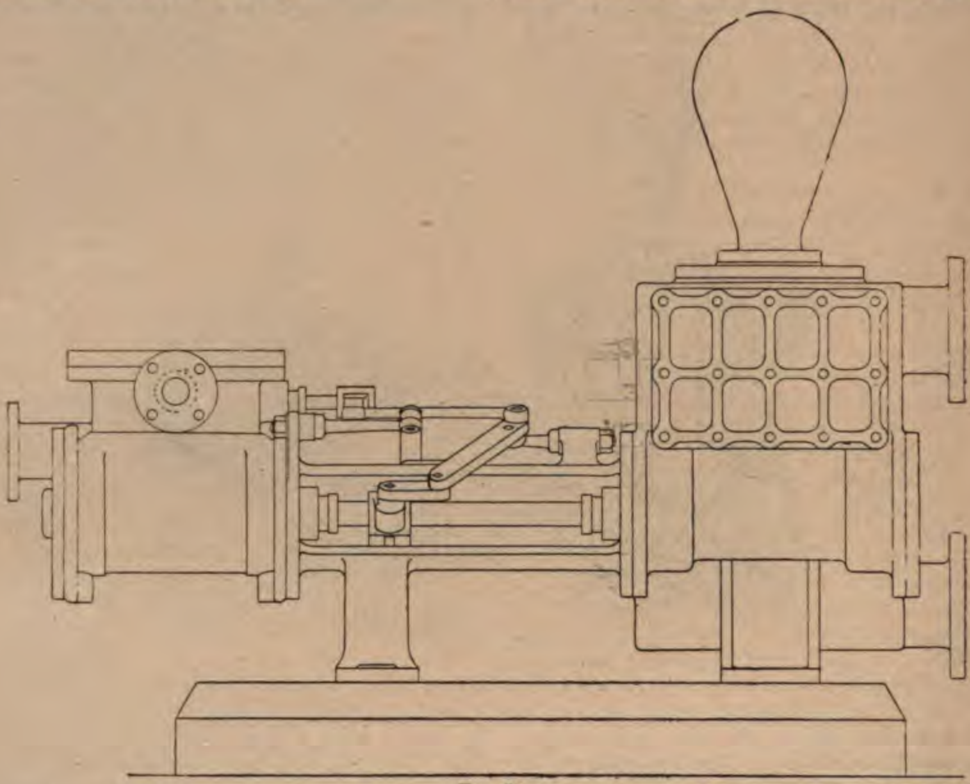


FIG. 2.

BEVER'S PATENT DUPLEX PUMPING ENGINE. (*See page* 276.)

The Spanish Transatlantic Company

has had a great work thrust upon it in moving the very large number of troops which the Madrid Government finds it necessary to send out to Cuba for the purpose of coping with the rebellion there. The company has, in fact, been obliged to considerably enlarge its fleet. For that purpose it has purchased the last of the White Star single-screw cargo steamers. This was during the last days of August. Many months previously it had acquired a vessel which it re-named the *Colon*. This fact was much discussed at the time, and I certainly saw a picture of the vessel in one of the illustrated papers then. Yet in its issue of the 26th August the *Shipping Gazette* writes, "Already the chartered Orient steamer *Colon* has taken a detachment of men." I do not care to dispute whether this is ignorance on the part of the writer in the leading shipping paper, or merely looseness of expression. It may be both. But it would be interesting to be told why the expression "chartered" is used, and when the now-named *Colon* belonged (under that or any other name) to the Orient Steam Navigation Company. Which of the Orient vessels does the writer miss and imagine that this vessel represents?

The Cunard Company,

though slow perhaps to move until it sees that a policy which has commended itself in former days to its careful judgment is really out of date, always moves with great decision when it has resolved upon a plan of action. In the days when it determined to build big ships first of all, it gave us the *Servia*, and built her of steel, when other people were content to construct the *Alaska* and *City of Rome* of iron. When it made up its mind to outdo other lines in speed it gave us the *Campania* and *Lucania*, of fully 50 per cent. more power than anything then afloat. So now, having determined to get rid of the old vessels which have served it so well, it loses no time in carrying out its intention. Another of the older vessels is now reported sold, and she has gone to the Clyde to be dismembered. Then, too, the *Gallia* is disposed of. But she, of course, has fetched a good price, for she was bought by a concern which is in want of good tonnage, and can pay a good price for what it wants. The good old ship must not pass away without a note on her performance. Built in the famous Clydebank yard of Messrs. J. and G. Thomson, she came out at the beginning of 1879, when the *Arizona* held the Atlantic record, and the *Gallia* never touched her in speed. But she was a fine boat nevertheless, and a great favourite with passengers. Her power exceeded 5,000 I.H.P., and she made her passages with the utmost regularity. Something about eight days was her average from Queenstown to New York, running often a quarter of a day less. She had compound engines, but of the three-cylinder type, and her machinery ran with a noticeable absence of vibration. In her long career she was commanded by several captains whose names will be remembered as long as Cunard's flourish. Captains Cook, McMickan and Haines all had her in turn, but perhaps the name most closely connected with her was the late Mr. Michael Murphy, who died when in charge, though not when at sea. Her career was quite uneventful. On one occasion she broke a blade off the Irish coast when outward bound, and putting back to Liverpool for repairs docked and fitted a new blade, and resumed her trip. On another occasion she broke her shaft when bound east. Her engineers succeeded in making temporory repairs at sea—though they did not get as much credit in the public press for their work as did some of their comrades on another occasion—and the voyage was completed at a speed of about 10 knots. During the last few years the *Gallia* was taken off the New York line and sent to Boston during the passenger season, and till the present year she held the record on that route in both directions. That record has now, as I mentioned at the time, been lowered by the same line's *Servia*.

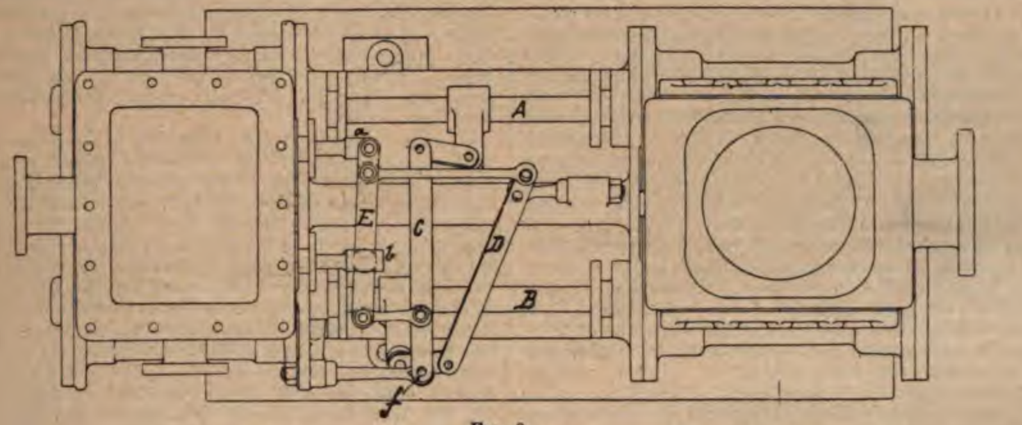


FIG. 3.
BEVER'S PATENT DUPLEX PUMPING ENGINE. (*See page* 276).

The Steamship Amalgamation,

which I referred to as rumoured in the last issue of these Notes is now an accomplished fact. I had wished to give some account of the lines whose fusion has taken place. But I find there are reasons which render this impossible. As I have said, the Wilson Line owned 90 vessels. Some of these are fine and modern boats. Others, though very suitable for the trades in which they are engaged, are of very small dimensions, and an analysis of the fleet, on the basis of that which I made of Cunard's, is therefore quite out of the question, as I should greatly exceed the limits of space permitted to me. Then another reason altogether hampers me in dealing with the Furness Line. That is of comparatively recent origin. It sprang into existence some 15 years ago. Five years ago it amalgamated with the shipbuilding firm, and since that time it has conducted other businesses beside the mere running of ships. Shipbuilders have to build vessels on speculation at times, in order to find employment for their regular staff. They also have sometimes to finance customers, and to take old ships in part payment of new. The ordinary shipowner gets a ship built according to the requirements of his trade, and he runs her till she is, for his purpose at least, out of date. A mixed shipowner—if I may be allowed the expression—does the same as far as his absolute shipowning business is concerned, no doubt. But as regards the other branches of his business, he does as others do in those trades, and the consequence is that there is a constant flow of ships new and old through his hands, and it is impossible at any given moment to say of what his fleet consists, what it may have cost, what it may be worth, or how it is adapted for the purposes of his business. For this reason I feel it advisable—unless I have some inquiry upon some particular point—to leave the constitution of the Furness Fleet severely alone at present. I may however mention that the new company is called "The Wilson's and Furness-Leyland Line, Limited." Its capital is £350,000 in £10 shares. It will thus be seen that it does not altogether absorb the other lines, for their united capital would very largely exceed such a sum as this. It is only a common fund as it were for the purpose of joint working in particular trades.

The vessels now advertised for the London and New York service, are a very interesting lot historically. There are two of the old Hill Line, one of the more recent Leyland liners, a recent Wilson boat, and another Wilson liner which commenced her career as one of the Royal Exchange Company's fleet. A similar analysis might be made of the London and Boston service. The joint services have already commenced running, and it is said, no doubt with truth, that vessels of a class worthy to compete with the Atlantic Transport Company's best vessels twin-screw boats will be provided as soon as they can be produced.

The Latest Castle Mail Packet.

On the 4th September, I had a very pleasant cruise in the new mail steamer, *Dunvegan Castle*. An early start from Fenchurch Street was made for Blackwall, where the liner was lying in dock, surrounded by several other members of the Castle family, and at about 10.30 a.m. we passed out into the river. As we dropped down to the Nore there was plenty to occupy our attention. We passed close alongside the Orient liner *Oruba*, outward bound to Australian ports, and she brought back to my mind a very pleasant trip of the same character as that upon which I was then engaged, but enjoyed with friends who will never go tria's more. We saw the Atlantic Transport *Missouri* too, whose appearance suggested the smart rescue of the ill-fated *Dunmark's* passengers. The weather was clear enough, but there were passing showers, and the attractions of the interior of the vessel held the attention of most of the guests. As, I think, has already been noted in the columns of THE MARINE ENGINEER, the *Dunvegan Castle* was built and engined under Lloyd's special survey, and in excess of the requirements of their highest class, by the Fairfield Shipbuilding Company, who have turned out no less than eight vessels of the line. She is just under 6,000 tons gross register; she is, of course, built of steel, and has three steel masts with yards on the foremast only. The vessel is constructed with a long forecastle, bridge deck and poop. Special attention has been given to the accommodation of the cheaper class of travellers, the third-class passengers being greatly considered. They are berthed forward and their privacy and comfort are cared for in a way which would surprise one who is used to the way emigrants in some other trades are housed at sea. The second-class passengers have a saloon the full width of the vessel, situated in front of the engine hatch. They have every convenience in the way of revolving chairs, pianos and decorations, whilst their staterooms are practically undistinguishable from those of the first class. Part of the promenade on the bridge deck is reserved for their use. They, of course, have ladies' cabin, and smoke-room. The main saloon is aft of the machinery space on the main deck. It is placed in this position because it is considered more comfortable than one further forward in view of the special climatic conditions of the Cape trade. The apartment is almost 50 feet square, and is panelled in oak. There is a large dome in the centre, and the interior of this and the ceiling of the rest of the saloon are decorated in white and gold. This gives a lofty and airy effect which will certainly be appreciated in the tropics. The smoke-room on the deck above is large and also lofty. It is panelled in oak and upholstered in pigskin. There is a well-arranged bar here, communicating with the main pantry by a service lift. The ladies' cabin on the same deck is upholstered in silk, the panelling being beautifully inlaid in the Chippendale style. Here the ladies have for their own use a handsome Broadwood piano. Aft on the poop is the wheel-house, containing the steering gear. This is Brown's steam tiller, with, of course, hand gear as a stand-by in case of any failure. The steam tiller, which is as effective as it is simple and ingenious, is actuated by one of Brown's telemotors in connection with the wheel on the bridge. I may mention here that accommodation for the stewards, including lavatories and stateroom, is provided in the poop under the wheel-house. This innovation will be appreciated generally. It will tend to the comfort of a very hard-working and obliging body of men; and it is not nice to reflect as one sits at table in the saloon that this is the sleeping apartment of the ship's servants.

The main staircase is faced by panels bearing the arms and motto of the Macleods, who are the immemorial holders of the Scottish castle from whence the vessel takes her name. In the case of the *Dunnottar Castle* and the *Tantallon Castle*, the two ships which immediately preceded this vessel in the Castle Mail service, it will be remembered there were very interesting publications giving historical accounts of the fortresses whence these ships derived their names. A little account was furnished to Messrs. Donald Currie's guests of the old ninth-century fortress which still dominates the northern end of the Island of Skye. It has, in its nearly one thousand years' experience, been associated with much of the history of Scotland, and with many famous men, including the great Rory O'More. It is still inhabited, and so combines historical interest with present comfort—and comfort is the characteristic of its namesake of 1896. Such men as Dr. Johnson and Sir Walter Scott have in their day dwelt upon its beauties and associations.

Returning to the main staircase, whence I digressed into the historical retrospect, we find at the entrance to the main saloon the pantries and serving-rooms. In the former there is a carefully designed cupboard where bottles of varied contents can be cooled to any desired temperature in the tropics. This arrangement, like an ingenious coffee machine in the serving-room, is the invention of Mr. List, the clever superintendent-engineer of the company, who brings his experience and ability to bear on every detail of the ship, however apparently trifling it may be, remembering always that attention to apparent trifles make all the difference between comfort and discomfort to passengers and crew alike.

Under the bridge-deck are houses containing most of the officers' quarters, the doctor's dispensary, the barber's shop, fitted with its electric appliances, and the sanitary convenience of the first and second-class passengers. The greatest attention, as is desirable in the Cape trade, has been paid to the sanitation of the vessels and the numerous marble baths provided with hot and cold, sea water, and sprays and douches, were greatly appreciated by the visitors. On the bridge deck are the separate promenades for the first and second-class passengers, and a big deck-house containing the rooms of the first officer and captain, and also a number of excellent staterooms for saloon passengers. Here I may mention that drawers, cupboards, and wardrobes adapted for the stowage of the clothes needed in a voyage of over a fortnight are everywhere provided for the use of the passengers. Above this deck-house is the navigating bridge with its telegraphs, the wheel-house, and chart-room. Above the fidleys are fan engines for the ventilation of the ship. Here I noticed another of Mr. List's inventions—a funnel stay which is always taut, the expansion and contraction of the metal being compensated for by an ingenious arrangement of springs.

The appliances for safety are very complete. The vessel has three complete decks, of which two are steel-plated and wood, sheated, and has no less than ten transverse bulkheads. On her quarter are slung four boats hanging on davits in the usual way, and secured against booms. The remainder of her boats, including those of the greatest capacity, are carried on the rail of the bridge deck, ready to be pushed outward at a moment's notice. She also has a cellular double bottom arranged for water ballast. Last, and most important, was the visit to the machinery department. The *Dunvegan Castle* is driven by a set of triple-expansion engines with three cylinders. The H.P. cylinder is forward, and 38 in. diameter. Then comes the L.P. cylinder, of 102 in. diameter, and aft of that the intermediate, which is 60 in. in diameter. All the cylinders are jacketed and the sequence is believed to contribute to steady running. Certainly the absence of vibration was remarkable. The stroke is 66 in., and the H.P. cylinder is provided with a piston valve. A Joy's assistant cylinder is provided.

Dunlop's governor is in use. It has a small engine interposed between its lever and the throttle. The ship has three double-ended and two single-ended main boilers leading to a single funnel. They are worked under natural draught. There is no donkey-boiler provided. Steam in port being obtained from one of the main boilers. In the auxiliary machinery is a set of three Siemens' electric light engines, and a Hall's refrigerating machine which provides cooling power for four chambers, where Cape products and passengers' food can be dealt with. It also cools drinking water for the ship's fountains. The question of water supply has had Mr. List's serious attention. A large amount of water is distilled for use of the boilers and the ship. She is fitted with Weir's evaporators and feed-water heaters, whilst a feed-water filter of Mr. List's own design is introduced. Here the purifying medium is coke, packed in layers, and laid in trays. The engines indicated 8,000 H.P. on trial, and the vessel's speed was 17½ knots. She will average a full 16 knots on the long Cape voyage.

Captain J. Robinson, the commodore of the line, is in command, and was most kind to the company's guests, who after lunch spent the afternoon in seeing over the vessel and playing the fascinating game of tethered ball, which looks so easy till one attempts it oneself. Dinner was followed by speeches, commendably brief, save in the unfortunate instance when a gentleman who was made spokesman for the Fourth Estate emphasised the truth of the remark that the gift of happiness in speech does not always accompany facility in use of the pen Then came a pleasant concert in the saloon, where we found that our company contained artistes of no mean calibre, and then to the smoke-room, for the electric light was not shut off promptly at the hour prescribed in the company's passenger regulations. By the time we adjourned the engines had stopped and the anchor was in the ground near Spithead. In the morning we ran up the Solent, and entered the Empress dock soon after nine. Then to the Dock Station, where special saloons were awaiting us, and so to Waterloo after an all too brief experience of Messrs. Donald Currie's well-known hospitality. It is needless to add that the *Dunvegan Castle* had a full list of passengers, who joined her later in the day. She is already superseded in the position of the youngest Castle boat, for since our trip the Fairfield yard has launched the *Tintagel Castle*, first of four sisters for the intermediate service.

Foreign Competition.

The announcement that Messrs. Yarrow are about to transfer a great part of their establishment to foreign lands, where Governments are more appreciative of honest work and ingenuity of design, and where strikes are comparatively unknown, is a matter which—though it affects all my readers—perhaps comes more properly within the province of my Naval colleague. I will therefore content myself with the mere announcement, and remark that we must not, on the other hand, take the flattering unction to our soul that Germany cannot do without us, now that she has determined to treat one of her big twin-screw North Atlantic boats as our Union Company treated their *Scot*. It is true that the vessel is coming over in the winter to a British dock for the lengthening to take place. But that is only because dry dock accommodation is at a premium in the Fatherland, especially for mercantile vessels. We may be sure that those who built the ship could lengthen her, if they had opportunity. They evidently do not altogether like the prospect of having the work done here, for there is a determination to build a dock on the Elbe which shall, in its area, rival that of which Southampton is so proud.

So probably in a few years we shall lose even the work of docking and repairing the foreign-built express steamer.

New Steamers.

In this connection we may note that, having seen a big cargo boat, big beyond everything conceived (always excepting the *Great Eastern*) turned out from Messrs. Harland & Wolff's yard, the Hamburg-American Line is going to Messrs. Blohm & Voss, of Hamburg, for a leviathan to keep her company.

Still Messrs. Harland & Wolff seem busy enough, for they expect this December to break their own, and the world's, record for tonnage launched during a single twelvemonth with a magnificent total of 94,000 tons of steam shipping. They have already launched the second of the three "G's" which they have in hand for the Union Company.

The New York Passage.

We have been treated to some very fine steaming this season by the two new American Mail boats. When they get in on ahead of the crack Cunarder we generally hear a good deal about the fact, regardless of the circumstance that the Liverpool passengers leave London some time after the Southampton passengers leave Waterloo, and of the further point as to the Queenstown call for the benefit of the British mails. That the Cunarders are faster is shown by the way in which, whenever opportunity offers, the British steamer draws up to and pass her newer rival. This was very noticeable on the trip which terminated on the 19th September when the *Lucania* caught the *S. Paul* two-thirds of the way across, and then slowly drew ahead and passed out of sight. It would be curious and interesting indeed if the relative H.P. and consumption at sea of these two pairs of sisters could be attained by the public. From what I hear, it would be surprising indeed and probably very satisfactory to the Fairfield designers.

A Boon to the Travelling Public

will certainly be given by the new departure of the P. & O. Company. It has already been announced, and indeed it is fairly well known, that the *India* and *China* are but the pioneers of a whole family of improved *Caledonias*. Thus the Bombay service will very shortly be carried out by vessels of a very improved class, both as regards speed, accommodation and size, to those which, even in recent years, have been provided for the Indian passenger. Advantage is to be taken of the sailing of the *India* on her maiden trip at the beginning of October to inaugurate a call at Marseilles with these vessels. The experiment has already been tried sporadically with the *Caledonia*, and I presume it has met with the success it deserves. There are several reasons why the move is a good one from the company's point of view, but it is sufficient for the British public to know that it will now be able to get to the winter resorts in the Riviera in well-appointed British steamers instead of stuffy and uncomfortable French railway carriages, and many will no doubt avail themselves of the opportunity of making a P. & O. voyage when the facility becomes generally known, and the certainty, guaranteed by the stringent provisions of the company's mail contract with H.M. Government, of an opportunity once a week each way is brought home to people's minds.

Racing in Narrow Waters.

Lord Colville of Culross and, I think, certain less known people also, have been complaining in the papers of the waves which the great Southampton liners send up in the Solent. The unfortunate nobleman has been as severely handled by the local press as a country editor can handle any one. He has committed the unpardonable sin. He has spoken against the port of the future, or rather, against the foreign ships which deign to use it. He is plainly accused of having written the thing which is not. I am not a votary of Cowes yachting and do not often see liners go down the Solent. So I am not a competent judge of the facts. But I am as well able to weigh the probabilities as anyone else. Lord Colville of Culross holds a position both in the public and in the yachting world which is such as to make one attach great importance to his utterances. Moreover, he opened the ball, and therefore must have had some reason for writing. There must at least have been some suggestion of waves for him to think of airing the subject. Besides, the specific instances he gave can easily be investigated if necessary, and proved no doubt by other witnesses. But I do not think it is necessary. For the point on which Southampton, by its press, bases its defence will not hold water at all. It says, "We don't raise waves because we have no object in doing so. We count our passages from the Needles, and we don't begin to drive till we get there." There are two answers to this defence. The first is that they like, we may be sure, to get a "flying start." The second is that though they may not, and do not, count their passages from any other start than the Needles, they have lately been trying to say, "We carried our passengers from London to New York—by which they mean Fire Island—in such and such time." Thus the South-Western Railway boasts and advertises the time in which it runs down its specials, and week by week we hear how short a period the mails were in transfer. So that as against Liverpool—which is their great rival—the American liners are really racing inside Hurst Castle and the Needles, and the contention that they have no object in running hard inside those points falls at once to the ground. The German steamers are not such sinners because they are not so keen after beating the through record, and besides, they are kept under tighter orders from headquarters. Lord Colville has done much good by his letter, and the Southampton press might remember that abuse is no argument.

WINN'S PATENT ADJUSTABLE SCREWING STOCK.

We have pleasure in calling attention to the accompanying illustration of a very compact, simple, and powerful form of adjustable screwing stock, patented and manufactured by Messrs. Charles Winn & Co., of St. Thomas' Works, Granville Street, Birmingham.

The stocks are made in two types, the first with dies and guides for cutting, the smallest size, tubes from $\frac{1}{4}$ in. to $\frac{3}{4}$ in. diameter, the largest size of this type being capable of dealing with tubes from 1 in. to 2 in., while the smaller size of the second type is fitted with dies and guides for bolts ranging from $\frac{1}{4}$ in. to $\frac{3}{4}$ in., the larger size ranging from $\frac{3}{8}$ in. to 1 in. bolts.

As will, in part, been seen from the illustration these Winn's adjustable stocks possess the following advantages over the ordinary form.

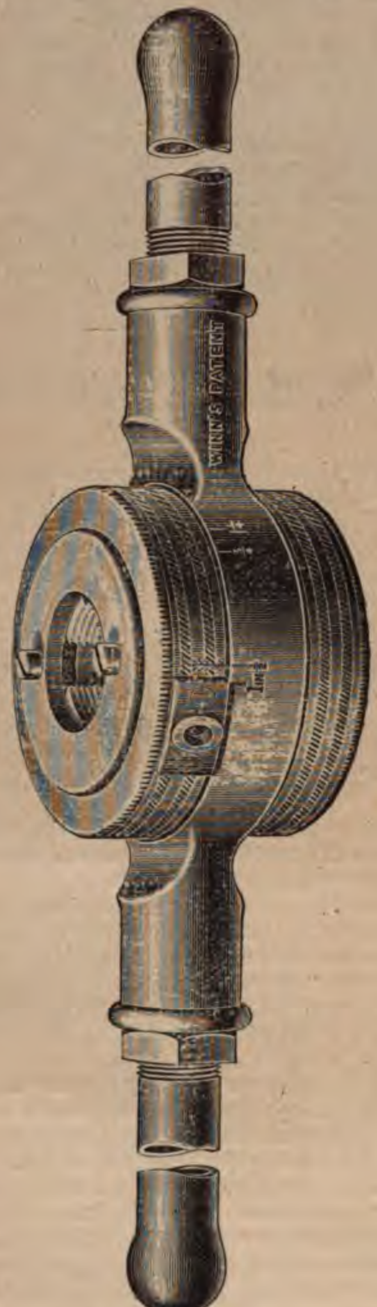
The dies can be accurately adjusted and set to suit any variation in the size of the article to be screwed, and as there are no loose parts nothing can be lost, while further, as the guides also are adjustable they can be set to suit the thickness of the tube, being screwed, thus always ensuring a true thread, whether screwing gas, water or steam tubes.

There are no pegs, or projections, on the dies to break off, and being of the chaser type, and in sections, they can be taken out and reground, on any ordinary stone without altering their temper, and can therefore be maintained in good condition more easily than any other type, in addition to which the stock can be worked with less labour than the solid stock.

The dies cut a full thread at one operation, and do not require to be turned back to remove them, it being only necessary to slack back the adjusting collar a quarter of a turn to admit of the stock being lifted off the tube, after which, the collar having been readjusted to the desired indications on the scale, the stock is ready to cut another thread, a simple and time-saving process entailing the minimum of wear and tear.

As will be seen, the handles are hollow, thus ensuring the necessary combination of lightness and strength, and are removable for portability in travelling while their rigidity when screwed into the stock is ensured by the lock nuts provided for that purpose.

Any further particulars of the tool, which appears to have met with well merited approval, will be supplied on application to the makers at the address given.



Messrs. The Nippon Yusen Kaisha of Japan, are having ten large steel twin-screw steamers built for them in this country, for general trade between Japan and London, all these vessels are being constructed under special survey with a *view to classification* with Lloyd's Register Society.

GLOBULAR WATERTIGHT BULKHEAD DOORS.

If there is one thing upon which the Admiralty, Lloyds, marine architects and engineers are agreed, it is that the means of closing of watertight bulkhead doors in cases of sudden emergency are far from satisfactory. This is so much the case in men-of-war, whose very existence depends upon the almost instantaneous closing of such doors, that

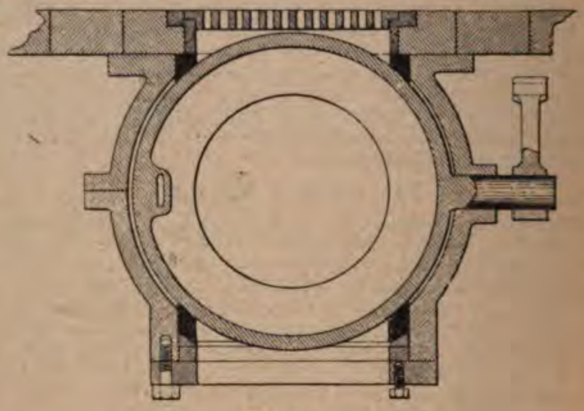


Fig. 1.

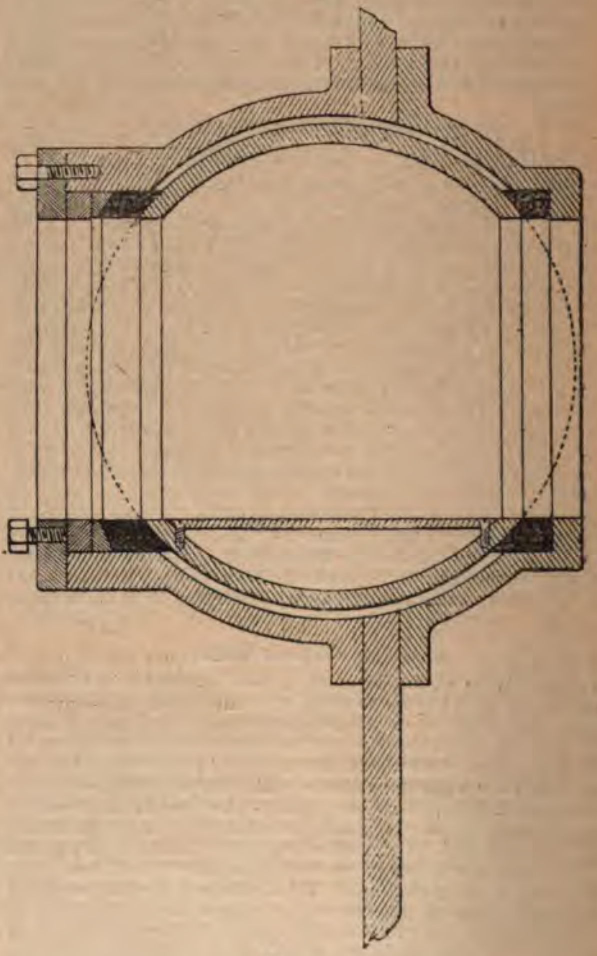


Fig. 2.

there has been an energetic campaign to remove as many as can possibly be dispensed with, even at great inconvenience to the crews.

It is plain to all experts that most of the gears now in use are subject to grave defects in slowness of motion in case of emergency, and many of the doors are fitted with lifting screws with a pitch of scarcely one-fourth of an inch. The amount of tedious labour in closing an opening of 30 in. is apparent, especially as one man or even two cannot exert sufficient power to keep the motion continuous, and in case of casualty arising from collision or stranding, the time thus taken to lower a door, the water gets into the vessel, and in most cases extinguishes the boiler fires, as this form of door permits coal and débris to accumulate in the doorway, thus preventing any chance of closing promptly.

In tunnel doors, it is well known to all sea-going engineers, that owing to the construction of the ordinary door, it clatters more or less when at sea; to prevent this a wedge is often inserted, with the result that when an accident does occur, the wedge is forgotten, and consequently prevents the door being closed, with the frequent loss of the vessel, and therefore the closing of such doors to be effective must be instantaneous and easily worked from the deck or bridge, which requirement entirely disqualifies such closing apparatus as racks or screws, that have to be operated at the door. In order also that such closing shall be easy, the doors should be balanced, or their heavy weight will either require great force or a power appliance which will much reduce the speed of closure.

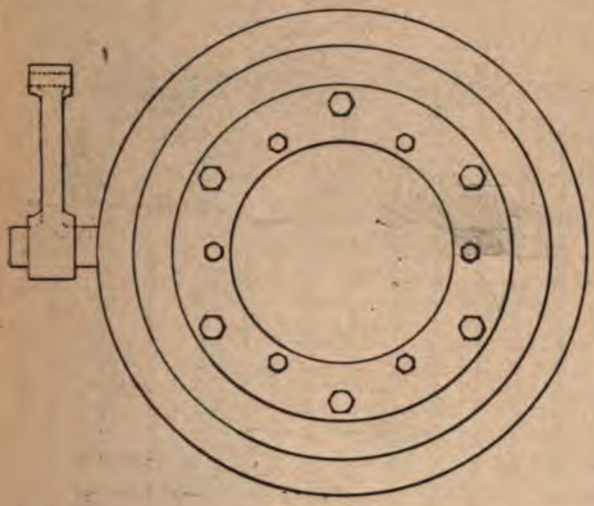


Fig. 3.

We have pleasure in illustrating herewith a new design for such doors, the invention of Mr. James Casey, marine engineer, of 10, Philpot Lane, London, E.C., which appears to fulfil the requirements, as above defined, much better than any others at present in use.

As seen in Figs. 1, 2 and 3, of which the two first views are sections, and the latter an outside view, the door is globular, like a hollow ball, with a clear passage through it. The globe is hung at its axis upon a pivot, and works freely in packing rings about the circular doors in the globe casing. The door is thus perfectly balanced on its bearings and will rotate by a lever on its pivot with great ease and a minimum of resistance. This is so much the case, that a light rod connection to a hand lever, like a signal lever on deck or on the bridge, will enable one hand to at once and instantaneously close all doors with ease.

The form is evidently one of extreme strength, when closed forming a double door, and capable of making a watertight joint on the rearward seating from any water pressure that may come upon the door, just as a ball-valve makes a joint on its seating.

In Fig. 1, a convenient arrangement for a hatchway door in a deck, with a ventilator grating for allowing escape of gases or fumes from coals or other cargo, is shown, and from the extreme ease and celerity with which the hatchway door can be closed it may readily be left open without risk for ventilation almost throughout the whole of a voyage, and thus many dangers from the generation of gases may be avoided.

In Figs. 4, 5 and 6 we show a transverse and longitudinal section respectively of the hull of a cargo steamer or sailing vessel, and the bulkhead doors being operated for closing, half closing, or opening, by a single hand, either from the lower or upper deck. It is proposed that an electric bell system shall be arranged at the doors and in the lower deck or house, so that signals can be given as to the closing of the doors by the deck hand, which can be acknowledged from below, or signals can be given from below to open the doors if required.

A strong plea for the working of the doors from the decks, rather than at the doors themselves, is that it has been found that where electric lighting is used on board, it is apt to suddenly extinguish under shock of collision or contact with a reef or other obstacle. In such case the confusion of utter and instantaneous darkness is added to the shock of a sudden collision, and it must be impossible under such circumstances to find and manipulate any complicated or power mechanism to close the doors down in the decks or holds below.

In the freedom and practical security of the open deck or a deck-house, a lever or levers could readily be jumped at and operated without mistake, and if any unfortunate members of the crew were shut in on the first closing of all the doors, were the hold or compartment clear enough of water to enable any imprisoned person to reach the signal bell, the door in such cases might be safely opened again and held in hand to permit of escape.

Taking it all around, we think the globular watertight door is the most practicable arrangement for prompt closure in emergencies that we have yet seen, and we shall be glad to hear of and publish any experiences with these doors at sea. It is already in work on board of a passenger steamer holding a Board of Trade certificate, and classed at Lloyd's 100 A1.

Institute of Marine Engineers. — The engineering and drawing classes will be opened on Thursday, October 1st, at the premises of the Institute, with a reception and social meeting, when the students will be addressed by G. W. Manuel, Esq., R.N.R. (past-president), and others. The awards of last session will be presented by Mrs. Manuel. The Educational Committee have arranged for a series of lectures, to be delivered during the session, by gentlemen connected with the engineering profession.

THE SEA-CARRYING TRADE.

THERE are signs of the times in the sea-carrying trade which portend important changes in the future. The disposition of owners of tonnage to-day to increase little by little the size of their steamers, and consequently increase their carrying capacity, is a proof that sooner or later the smaller craft which has been employed in recent years in the foreign and colonial trades will, on economic considerations alone, be out of the running, because it will not be able to obtain profitable employment. During the past few years, and particularly during the last year, the shipping built has been generally of very large tonnage, and it is not unusual to hear of vessels being launched which will carry 10,000 or 20,000 tons, and, in one instance, 30,000 tons of cargo. With modern, economical engines it is evident that great bulks of cargo like these can be carried at small cost of freight, and smaller ships in the long run can have no possible chance of competing with these leviathan tramps. But there is another significant fact that not only are small ships likely to get thrown out of employ, but small owners are likely also to lose their occupation. What is the fact at the present day? The big steamship companies which are engaged in the passenger trades, such as the Cunard and White Star lines, carry with their large trans-Atlantic and other steamers cargoes at freights which the ordinary trader cannot touch. This class of steamer must have cargoes at whatever rate of freightage can be secured, as they have to sail at certain dates whether they have cargoes or not. This feature of the trade has developed to such a marked extent in recent years that the big companies have been led to extend their scheme of trade in order to carry a vast bulk of traffic which their ordinary liners cannot deal with. Hence, huge cargo steamers have been built which can carry an immense tonnage of goods of all classes, and these steamers are invariably owned by the big companies. The effect will ultimately be that small owners will cease to exist and small tonnage steamers will not get employment in the best routes of trade, because they will not be so well able to secure casual cargoes as the organised big houses, nor will they be able to compete with the small rates of freight charged where big ships are employed. The further result of this development will be seen at an early date in the transference of moderate sized steamers into the coasting trades, and that will tend to keep down freights in this direction. But here again the coasting trade, so far as casual ships are concerned, is gradually being taken up where there are anything like continuous and regular cargoes, by ships specially built for the purpose, such, for instance, as in the carriage of iron ore from Spain to England, and to other ports on the continent. The general all-round tendency is to squeeze out little owners and small steamers of all types hitherto employed in the foreign and colonial trade. Sooner or later this change will bring into the market many obsolete ships to be broken up, and to a great extent it will alter the character and class of vessel to be built for future service at sea. From a domestic point of view this change will be of a distinct advantage because cheaper freights will mean cheaper food for the people and a cheaper supply of the various necessities of life that are drawn from foreign and colonial sources. The shipbuilding industry will not profit by the alteration of circumstances, except so far as the building of modern leviathan cargo ships are concerned, and small yards will not be able to tackle this work. The chief loss will be to the small shipowners who have to depend on haphazard cargoes, as they will have to compete in many cases against big and powerful lines whose means of securing traffic are much better and much greater than small owners can hope to command.

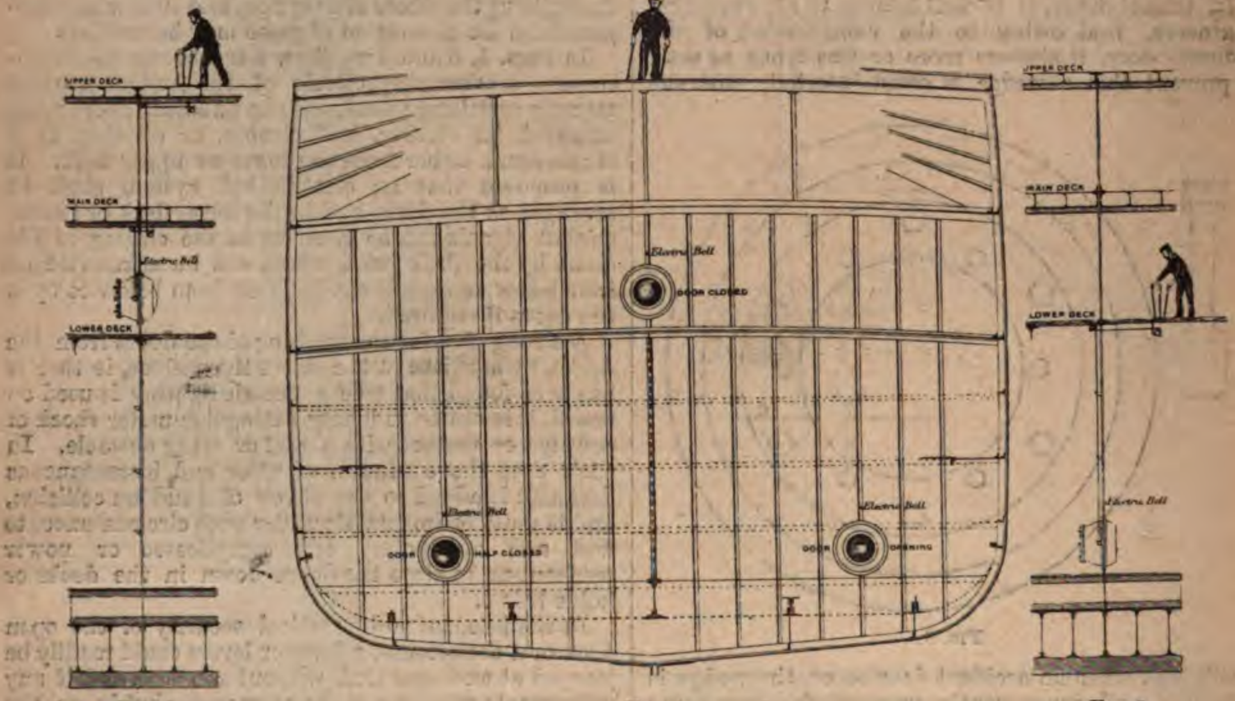


FIG. 5. FIG. 4. FIG. 6.

GLOBULAR WATERTIGHT BULKHEAD DOORS. (*See page* 282.)

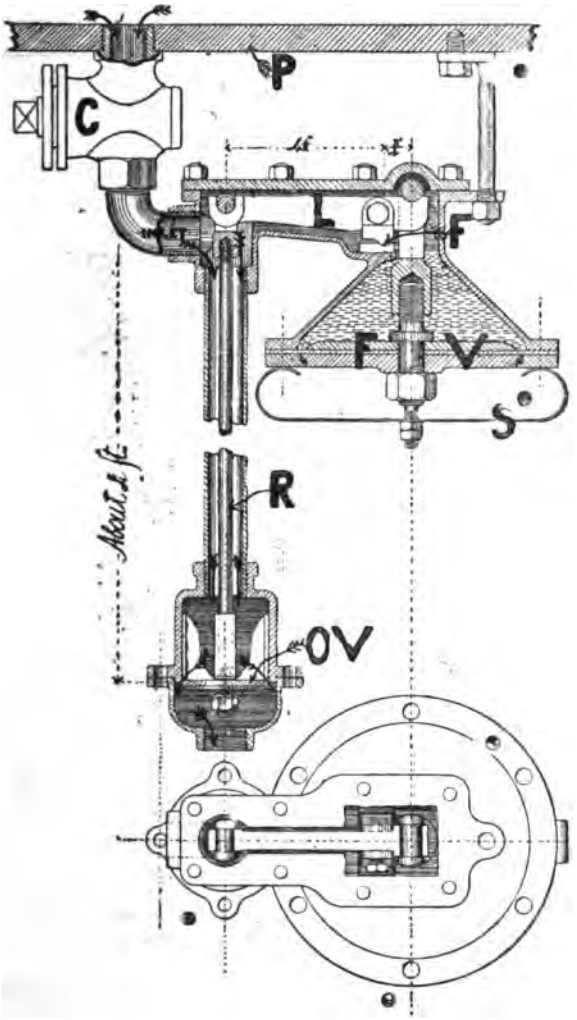
AN IMPROVED TAPERED SEARCHER GAUGE FOR ENGINEERS.

WE have had the opportunity of inspecting a tool which we think will meet a long-felt want amongst engineers. It is an improved searcher or feeler, and consists of six tempered steel blades each being 4 in. in length, and tapered from ½ in. at one end to ¼ in. at the point, so that it is suitable for testing couplings and fractures which the ordinary feeler gauge is not adapted. The blades are each of a different thickness, the thinnest being 1-250th part of an inch, and the thickest being 1-63rd of an inch. In this way you have the means of making a great variety of thicknesses, ranging from a minimum of 1-250th of an inch to a maximum of 11-200th of an inch, by the combination of the blades in the number of different ways you can use six different articles. The blades are each engraved with its thickness in thousandths of an inch. The blades are all hinged to and turn into a steel case, similar to a pocket knife, and are so compact as to be readily carried in the vest pocket. The case is ½ in. wide and a trifle more than 4 in. long, on one side of which is a 4 in. rule divided into 16ths of an inch, and on the other side is engraved the French metric scale.

The tool is well made and very neat in appearance and can be obtained from the inventor, Mr. D. Nield, 19, Devonshire Road, Holloway, London, N.

BALL & GREER'S PATENT STEAM TRAP AND REDUCING VALVE.

By availing themselves of the simple and reliable expedient of utilising the weight of a column of water to operate the discharge valve, the inventors have succeeded in producing a steam trap combining certainty and rapidity of action with the minimum of moving parts, *desiderata* which should commend this trap to the favourable consideration of all steam users.



As will be seen from the accompanying illustration, the apparatus is not a compensated pendulum arrangement, but is simple and substantial in construction, and consists of a lever L, placed in a gun-metal casing, and moving on the adjustable fulcrum F.

To the short end of this lever is linked the flexible valve, or diaphragm F V, while to the longer arm of the lever is connected by the Rod R, the, relatively, small outlet valve O V.

It will be noticed that the areas of the larger and smaller valves bear the same ratio (as 6 : 1) to each other as the two lengths of the lever L bear to each other, and thus, however the steam pressure may vary, the two valves are always in equilibrium, a state of rest only disturbed when a sufficient head of water has collected over the outlet valve O V, to overcome the spring S, when the valve would be opened by the weight of water above it, closing again when the water had been discharged into the hot well, or tank, to which the casing of the valve is suitably connected. As a comparatively small head of water suffices to open the valve, owing to its being suspended from the longer arm of the lever, it follows that the apparatus is not only very sensitive, but also instantaneous, in its action.

The light and adjustable spring S serves the double purpose of counteracting the weight of the valve O V, with its rod R, and of always retaining a pre-determined small quantity of water over the valve. An ordinary cock C, enables connection to be made with the pipe P, or any other vessel, to be trapped.

The reducing valve is constructed on the same principle as the trap just described, but it is obvious that the part which is the inlet end of the one is the outlet end of the other, the valves being arranged accordingly.

As a reducing valve the apparatus maintains a constant and steady pressure of steam, the spring only needing to move through a very small space to admit of the valve being full open, and it will also pass any steam through it even though the pressure in the boiler may be below that for which the spring is set.

The makers of these traps, Messrs. Ball & Greer, of 38, Bishopsgate Street Within, E.C., have supplied a large number of them to steamship owners and engineers, amongst whom we notice the names of Messrs. Bucknalls, Messrs. Lund, Messrs. J. Holman & Sons, Messrs. William Esplin & Sons, Mr. James Pollock. the London Distillery Co., &c., &c., and in each instance they have proved in every way satisfactory.

POWER DISTRIBUTION IN THE CYLINDERS OF COMPOUND AND TRIPLE-EXPANSION ENGINES.

By MR. WALTER W. HOUFE.

An article headed as above appeared in *Cassier's Magazine* for May, 1896, which, in a very ingenious manner, endeavours to persuade one that the teachings of Prof. Rankine and others with respect to this subject, amongst the latest of which is Prof. Elliott's paper on "The Sizing of Marine Engines," are paradoxical. The author, Mr. W. M. Henderson, commences his article with a statement to the effect that his remarks are based upon a theory advanced by B. F. Isherwood, U.S N., in a report in 1883, and are illustrated as in Figs. 1 and 2, which represent the two cylinders of a tandem compound engine. He briefly states that the prevailing belief in back pressure reacting from the low to the high-pressure cylinder is shown to be an error. The actual operation appearing to be that the steam, after impelling the piston of the high-pressure cylinder to the end of the stroke, passes to the low-pressure cylinder and presses equally on both pistons; the low-pressure piston is driven onward by the excess of area possessed, after deducting from the central portion the area of the high-pressure piston. The marginal ring represents the effective area of the low-pressure cylinder, the central portion being non-effective as to power, but neutralizing the area of the small piston, relieving it of all back pressure from that source. He further says that there is a back pressure, but it is that acting against the piston of the low-pressure cylinder, and that no change of relative position of the two cylinders, such as placing them side by side or putting a receiver between them will disturb the mode of action described, excepting needful back pressure due to compression, for so long as the steam has a passage from the high to the low-pressure cylinder, working on the compound principle, the open communication will outline the area of the small cylinder upon the large, producing the effect described. In further explaining he says, he considers a pair of scales, with a one-pound weight in each pan, just as much in balance as when they were unloaded, for they are free to oscillate up and down with any disturbing influence; and further, that by conceiving two cylinders of equal size, with a piston in each, and steam of any varying pressure, common to both, it will in effect be the same as with the scale balance, the pressures on the pistons neutralizing each other. If one of the cylinders and the piston within it be enlarged, the same balancing effect will be produced to the extent of the smaller piston, which may be imagined to outline its prescribed area upon the central portion of the large piston, leaving a marginal ring equal to the excess area. It is upon this ring portion only that the effective pressure can be exerted. The central portion of the large piston neutralizes the area of the small piston, relieving it of all back pressure. From this it would appear that counting as effective the full area of the low-pressure cylinder, and deducting the mean pressure between the two pistons from the steam pressure on the working side of the high-pressure cylinder is an error, the fact being that the pressure on the working side of the smaller piston is the full pressure there, and the effective area of the large piston is reduced to the marginal ring previously described. Thus the power of the smaller cylinder is made exactly as much greater as the larger cylinder is made less, and equals the small piston's area multiplied by the mean pressure on the large one, and while the aggregate power is just the same as given by the indicator, the distribution of the load between the two cylinders is all out of balance.

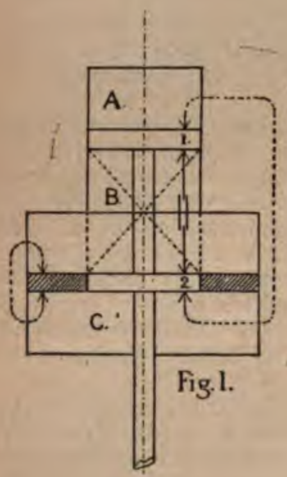


Fig.1.

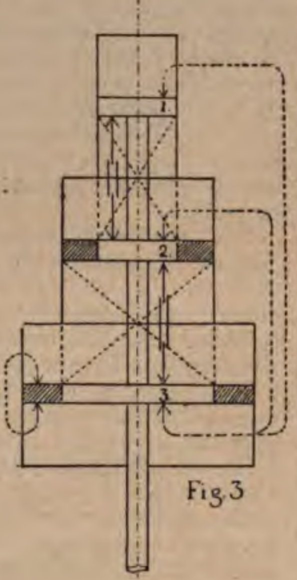


Fig.3

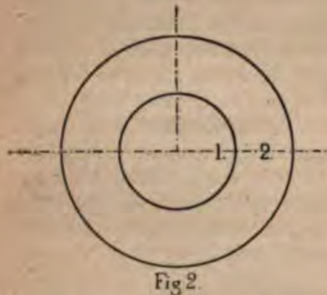


Fig 2.

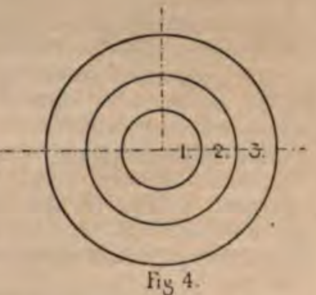
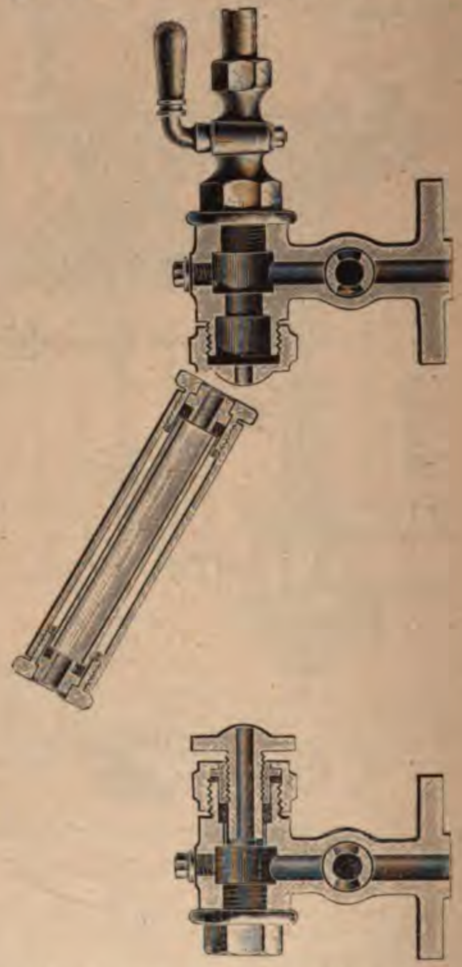


Fig 4.

(To be continued).

AN IMPROVED WATER GAUGE.

A VERY ingenious and useful improvement in water gauge fittings, has been invented by Herr Theodor Maas, of Mannheim, Germany, which is adaptable to ordinary water gauge fittings, and by means of which an old or broken glass can be replaced by a new one in half a minute. We illustrate this device in the adjoining diagram, which is practically self-explanatory and needs little or no description to be fully comprehended. In the diagram before us it will be seen that the ordinary gland nut and packing ring have been removed and are replaced with a nut having a spherical portion at the upper part. The packing ring and gland nut are retained on the top



bracket, and the former is tapped with a thread to engage a screwed adjusting piece with a spherical face similar to the bottom nut. The glass tube is held by two screwed nipples within the protecting casing. These nipples make a joint with the ends of the glass tube, through the medium of washers, and are adapted at their outer ends to make a joint with the spherical projections on the top and bottom brackets, such adjustment being effected by screwing down the adjusting piece in the top bracket.

By this arrangement the glass tube is not influenced in any way by the bending or bulging of the end or side of the boiler on which it is mounted, as the spherical joint allows of its perfectly unrestrained self-adjustment, and fracture or failure of the glass case cannot be brought about by this cause. Further, fracture from variation of temperature due to water, steam, or a current of air, is not so liable to occur as in the ordinary arrangement.

By having on hand a spare casing with glass in place, a broken glass can be replaced in 20 or 30 seconds, and thus greater safety in working is assured, and lastly, but not least, the difficulty and danger in removing a broken glass from the packed glands of an ordinary fitting is entirely obviated. This apparatus should readily commend itself to steam users and should well deserve a trial. From a certificate given by the managing department of the workshops of the State Railways in the Grand Duchy of Baden, we learn that three locomotives have been fitted with the devices and the results have been eminently satisfactory.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our own Correspondents at home and abroad.)

Rocks Ahead.

THE outlook at the time of writing is full of gloom, since a large party in the nation appears to be desirous of pushing us into a war for which we are not and cannot be prepared. Early in September the world was horrified by a repetition at Constantinople of the massacres which have made the rule of the Sultan to stink in the nostrils of civilized men. The cue was given by a band of Armenian revolutionaries who captured the Ottoman Bank and threatened to lay it in ruins. Owing to the prompt action of the British and Russian diplomats this matter was settled by the deportation of the assailants who, to save the lives of the bank *employes* were shipped off out of the country. They brought down, however, terrible vengeance on their co-religionists, who, to the number of 5,000, were stoned to death or killed with clubs by the exasperated Turks, with the permission and cognizance of the authorities. Naturally the lives and property of all Christians in Constantinople have been endangered, and bluejackets and marines have been landed from the gunboats as a protection. These fresh Armenian atrocities have stirred up a vast amount of feeling in this country, and what amounts to a crusade has been preached from pulpit and platform, some of the agitators going so far as to urge the necessity for immediate action upon the Government. Happily, wiser counsels have prevailed in many influential quarters, and it is to be hoped that the country will count the cost before it blindly plunges into a European war.

Isolation and Impotence.

The fact is that now, just as was the case before the Russian War of 1854-5, the people have very erroneous notions as to the duties and uses of a fleet. Then the late Sir Charles Napier was abused and insulted because he did not fling his ships against the stone walls of Cronstadt, and because he did not accomplish physical impossibilities. Now there is talk of sending the Mediterranean Fleet to coerce the Turk as if the word only has to be spoken and the thing can be done. If Constantinople was an island our fleet could indeed cut it off from the rest of the world, but all the fleet can do now is, if ordered, to insure the safe landing of an army or bring about a blockade of the sea coast. But the army has to be found for the purpose. If it was likely that only the Turks had to be dealt with our own little army might possibly be sufficient, but as any isolated action on our part would most certainly bring against us the Russians and the French it is obvious that we are practically impotent to move unless it is intended to force on a European war. As at present it is far from certain that diplomacy has said the last word, this course at least would be premature. It has been asked whether the British fleet could force the Dardenelles. Of course it could, but it would hardly do so without losing some vessels, and sustaining a large amount of damage. Seeing that, as Sir Charles Dilke has pointed out, a British line-of-battle-ship counts for us as much as an army corps does to France or Germany, it is worth consideration whether the game is worth the candle. What could the fleet do if it entered the Sea of Marmora, and anchored at the Golden Horn. Hardly anything. We could not bombard an unfortified town, while such action would almost certainly lead to a massacre of all the Christians. And when our ships had forced the Dardenelles and arrived off Stamboul it would be to find that the Russian Black Sea fleet had entered the Bosphorus, and was there before it. The agitators will do well to give heed to the rocks which lie ahead.

Portsmouth Dockyard.

By the completion of the trials of the *Prince George* upwards of a thousand hands are released for work upon the *Cæsar*, *Gladiator*, and other vessels in the yard, so that it is likely that renewed progress will soon be reported. The *Cæsar* has shipped her boilers and great part of her machinery since she was floated out of dock and the armour plates for the bulkhead screens are being placed on board this battleship. The *Gladiator*, which is being built on No. 5 slip, is to be pushed on as rapidly as possible without taking extreme measures so that the slip may be vacated in order that the *Canopus*, battleship, shall be laid down there. The *Royal Arthur*, which vessel, by the way, was launched from the same slip, is now here paid off, having returned from the Pacific where she was flagship to Admiral Stephenson. The vessel was completed with coal before paying off, which seems a curious thing to do since she is to go into the Dockyard Reserve for repairs. The ships of the Channel Squadron having gone, their places have been taken by those of the Training Squadron which belong to this port, and these will now undergo some repair before again sailing on a cruise. The torpedo-boat destroyer flotilla at this port has now been augmented by those formerly attached to the Portsmouth ships of the Channel Squadron, Several of these small craft are in the dockyard hands for repairs, and in the meantime, in order that instruction may go on, other vessels in the reserve have been commissioned by their crews. The float out of the *Cæsar* was not an inspiriting affair, but it was most creditably performed without a single hitch. The cruisers which were mobilised for manœuvres are now being taken in hand and the *Mercury* is first on the list for dockyard examination and refit.

Naval Engine-Room Complements.

In the journal of the Royal United Service Institution for September is published the discussion which took place on May 1st upon the Naval Prize Essays for the year. In this discussion three officers of the Royal Naval Engineer Corps took part, and their speeches form most interesting contributions to our knowledge of the feelings of the service on the questions considered. Chief Inspector of Machinery C. M. Johnson spoke at some length, covering most of the points referred to in the essays. As regards the stokers and the stoker reserve, he is of opinion that the training of the second-class stokers is inadequate, and that the physical standards are too low. He says, "It seems to be thought that firing a boiler is a thing which comes naturally to every son of Adam who finds himself in front of a furnace with a shovel in his hand. It is a fallacy. My experience is that a man may be twenty years in a stokehold and yet be unable to fire scientifically or even efficiently. . . Very few of those now listening to me can have any conception of what is involved in hauling out a fire from a furnace $6\frac{1}{2}$ ft. to $7\frac{1}{2}$ ft. from mouth to bridge, and from 3 ft. to $3\frac{1}{2}$ ft. across the bars. If the fire has been properly burnt down before drawing, there will still be from 8 to 10 cubic feet of glowing clinker and ashes to be hauled out, and this, be it remembered, up an inclined plane to the furnace mouth, which may be 3 ft. 6 in. from the stokehold plates. The physical power required to be exerted to do this work must be seen to be appreciated." The grant of warrant rank to the engine-room artificers, Mr. Johnson considers certain to come, but in the meantime he advocates giving an additional 2d. a day on re-engaging as an inducement to good men to rejoin. The "greasers" of the Mercantile Marine may form a reserve of leading stokers, but could not fulfil the duties of engine-room artifices. As to the supply of engineers, he supports the view of Captain Eardley-Wilmot, that they should enter a common training college with naval cadets and without any distinction, the selection being left to subsequent examinations. The present training of young engineer officers Mr. Johnson regards as most unsatisfactory.

Some Other Opinions.

The other two gentlemen of this branch who spoke were Staff Engineer R. W. Edwards, of the *Powerful*, and Engineer L. E. Thumwood, of the Royal Naval College. Mr. Edwards dealt more particularly with the insufficient number of candidates for the Naval Engineering Corps and its causes. In the first place, he instanced the case of an engineer officer who told him that he did not consider the position of a naval engineer officer was good enough for his son, considering the cost his youngster's training had put him to. This, he held, pointed to the fact that the young fellows whom it is desirable to get in the service, and who get their training in outside firms,'do not consider the Navy to be good enough on the present terms of pay. Secondly, another matter which he believed to influence the likely class of candidates was the peculiar position of the naval engineer, "who appears to them to be in the service, but not of it." Mr. Edwards, whose experience is not to be questioned, says: "When people outside a dockyard, port or shipyard talk about a naval engineer, the ordinary idea in their minds is that he is something like a penny steamboat man, or the driver of a locomotive on the railway. They do not recognise that he belongs to the Navy at all, and it is not until people get to know him that they begin to find out what he is. Youngsters outside note these things, they see how the position of a naval engineer is not understood, and they don't think it good enough to join a service in which they get no defined position, for they think they can do better on shore." With regard to the remedy, "The engineer officer should be made an executive in his own department, and have the style and title of an executive officer to indicate his position, not only to people on board ship, but to people outside, who may know he is a naval officer, but do not know his rank." Mr. Thumwood denied that there was a lack of co-operation and sympathy between the executive and engineering officers of the service. He said, "I deny that it is at all wanting even in time of peace, but in time of trial, rest assured a perfect co-operation and mutual accord will be found to exist."

Devonport and Keyham Dockyards.

The commissioning of the *Talbot* and *Flora* at this port takes away two old stagers here, the *Talbot* having been launched here on April 25th last, and the *Flora* never having done any commission before, except for manœuvres. The *Talbot* relieves the *Magicienne* in the West Indies, and the *Flora* carries relief over to the East Indies. The places of these vessels in the reserve, will be taken by the *Juno* and *Dido*. It is expected now that the *Furious* will be launched here on November 4th. This vessel has not been pushed on, and her sisters at Portsmouth and Chatham are marking time, apparently because it is desired to see what kind of trials the *Arrogant* will make, this vessel having to make her essay in December next. The *Ocean* battleship is to be laid down here at the end of the year, and will be the first battleship built in the dockyard. We are still anxiously awaiting the arrival of the torpedo-boat destroyers, *Fervent* and *Zephyr*, building at Paisley. These vessels were ordered in 1893, in the first batch of destroyers, but hitherto no orders have been received as to sending navigating crews for them. They will be nearly out of date by the time they are delivered. The ships of the Channel Squadron have taken their departure, but have left behind their tender, the torpedo-boat destroyers who will be attached to the instructional flotilla. These little craft are constantly in the hands of the mechanics, but it is wonderful how trifling on the whole are the defects they develop, considering the vast amount of work they perform. The return of the *Edgar* to pay off will cause additional work, and it may safely be said that there never was a time when Devonport and Keyham were in fuller swing in all departments than they are at the present time.

Launch of the "Cæsar" and "Illustrious."

Two more of the battleships of the Spencer programme took the water in September, the *Cæsar* being floated out of dock at Portsmouth on September 2nd, and the *Illustrious* at Chatham on September 16th. The other vessels of this design are the *Magnificent* and *Victorious*, built at Chatham; the *Majestic* and *Prince George*, built at Portsmouth; the *Hannibal*, building at Pembroke, and the *Jupiter* and *Mars* by contract. The two vessels now put into the water are to be completed for sea in 1897-8. There will not be a very great deal of difference between these vessels and their prototypes the *Majestic* and *Magnificent*, the alterations chiefly relating to armament. The loading positions for the latter vessel's powerful guns, carried in pear-shaped barbette towers with steel mantlets to protect the breech of the pieces, are so arranged that it is unnecessary to bring the guns into the for-and-aft line. Hydraulic or hand gear can be used in any position, which will thus give a saving in time These fittings were designed at Elswick. The machinery of the *Cæsar* is from the firm of Messrs. Maudslay, Sons & Field; while that of the *Illustrious* is supplied by Messrs. John Penn & Sons, who have also fitted induced draught in their ship. The machinery consists of two sets of triple-expansion engines, driving twin-screws, steam being supplied by eight cylindrical boilers at 150 lbs. pressure. The engines are designed to develop 10,000 H.P. under natural draught, and 12,000 H.P. with forced or induced draught, with speeds of 16·5 and 17·5 knots respectively. The ordinary coal stowage of the ships is 900 tons, but arrangements are made for carrying in an emergency as much as 2,250 tons. Both vessels will now be pushed on in readiness for their trials.

Speed Trials of the "Victorious" and "Prince George."

Another pair of the vessels of the type referred to above have just completed in the most satisfactory manner their machinery trials. The *Victorious* made her runs on the Maplin. Under natural draught, in an eight hours' trial, the engines developed 10,316 I.H.P. (starboard 5,098, port 5,218), with a steam power in the boilers of 146 lbs. to the square inch, while the average speed as shown by patent log was 16·92 knots. The revolutions per minute were 98·9 starboard and 97·3 port; the vacuum in condensers was, starboard 25·6, port 26·84; the air pressure in the stokeholds was ·26 inches; the draught of water forward was 24 ft., aft 26 ft. 10 in.; the consumption of coal was 191,000 lbs., an average of 2·31 lbs. per I.H.P. per hour. At the forced draught trial, which was carried out for four hours, the figures were: draught of water 24 ft. 2 in. forward, 26 ft. 1 in. aft; speed of ship 18·7 knots; steam pressure in boilers 147 lb. per square inch; air pressure in stokeholds 1·25 in; vacuum in condensers, starboard, 27·4, port 26·4; I.H.P. 6,139 starboard, 6,062 port, a total of 12,201. In both the H.P. and steam the contract requirements were thus exceeded. The 30 hours' coal-consumption trial, steaming continuously at half speed, was carried out from the Nore to Start Point and back. The official figures are: draught of water forward 24 ft. 2 in., aft 26 ft.; speed of ship by patent logs 14.9 knots; steam pressure in boiler 145 lbs. per square inch; air pressure in stokeholds *nil*; vacuum in condenser, starboard 27·5, port 27·3; revolutions per minute, 88·0 starboard, 85·6 port; mean I.H.P. 3,121 starboard, 3,084 port, a total of 6,205. The coal consumption was 296,950 lbs., representing 1·6 lb. per I H.P. per hour. Although the results were not quite so good, the trials of the *Prince George* were equally satisfactory. When the ship went out for her eight hours' natural draught trial she was drawing 24 ft. 11 in. forward, and 25 ft. 2 in. aft. The following are the results: steam in boiler, 150·7 lbs.; vacuum, starboard, 25·7 in., port 25·5 in.; mean number of revolutions 97 a minute, air pressure 0·44 in., total power developed 10,464 H.P., and speed 16·52 knots.

Chatham Dockyard.

The floating out of the *Illustrious* has been the chief event of the past month, although perhaps we are inclined to lay greater stress upon the splendid performance of the *Victorious*, which is most creditable to the yard, and to Messrs. Hawthorn, Leslie & Co., the contractors for the engines. The *Gossamer* has been commissioned here as tender to the *Melampus* at Kingston, and this is the only vessel to hoist the pennant very recently at the port. In some way things may be said to be dull now, for the ships of the Channel Squadron have gone, and those of the Training Squadron will want but little done to them Some of the mobilised ships have been taken in hand and wil afford work for some time. Of the vessels turned out here under convoy of the *Blenheim* and *Endymion* to go to the Mediterranean all were ready in good time, the *Handy*, *Hart* and *Banquo* being in splendid trim for foreign service. Now the *Victorious* and *Illustrious* have made a step in advance, more men are at liberty for other vessels and the *Goliath* battleship will soon be laid down in the dock vacated by the *Illustrious*.

Temperley Coaling Apparatus.

The Temperley apparatus for coaling ships at sea has been tried in some of the vessels of the French Mediterranean Squadron. Success appears to have attended these trials as in those made in our own Navy, but only when the circumstances were favourable, and it does not appear, from such reports as are to hand, that the foreigners are more convinced than British officers have been. Four types of vessels were chosen for the French experiment, the coaling ship being the *Lutecia*, and according to the programme 300 tons were to have been put on board the *Brennus*, 200 tons into the *Courbet*, 150 tons into the *Proude*, and 100 tons into the *Casabianca*. In harbour and in calm water an average of sixty tons an hour was achieved, a result which has been considerably bettered in the British Navy, and which was obtained before the Temperley apparatus came into use. An attempt to coal the *Courbet* battleship in the open sea had to be abandoned, owing to the rough weather. The French papers which refer to the experiment fully recognise the comparative value of the apparatus, but like the experts on this side of the Channel, they consider that it is better policy to supply defended coaling stations than to trust to any problematical method of coaling at sea.

Liquid Fuel in Germany.

The Germans appear to have made up their minds as to the value of the "Masut" liquid fuel, experiments and trials with which have been in progress in their war navy for a considerable time and in a very thorough manner. Large reservoirs for the stowage of this fuel have been constructed at Wilhelmshaven, and others on the same principle and for the same purpose are to be erected at Kiel and Dantzig. No doubt, as several vessels are now using this description of fuel, it became necessary to supply reservoirs and to make provision for its more extended use. It is claimed for this fuel that it possesses advantages over others in regard to economy, great heating power, and the practicability of very rapid stoking. There are, however, disadvantages, the material being highly inflammable and the results of a shell bursting in or near the tanks in which it is kept being only guessed at. It is seriously argued, however, that if a shell burst in a reservoir of petroleum the only result would be to spill the oil, but it is not contended that liquid fuel can be used as coal is, as a protection. Possibly the two fuels will be found in conjunction, as they are now used in some of the warships of the Italian navy. After all the main question is one of supply, and so long as this country and the colonies can yield plenty of good, cheap coal it is unlikely that we shall follow the example of less advantageously situated nations, even if the gain in other directions may be held to outweigh the obvious disadvantages. It has been more than once stated that the Admiralty intended to fit a cruiser for the use of liquid fuel, but so far nothing has been accomplished in this direction.

Launch of the "Saint Louis."

The French battleship *Saint Louis* was launched at Lorient on September 8th. She has a displacement of 11,275 tons, with a length of 380 ft., a beam of 66 ft. 6 in., and a draught of water of 27 ft. The main armament will consist of four 12-in. guns, coupled in turrets, one forward and one aft, protected by 15¾-in. steel, and ten 5·5-in. quick-firers, of which four are on each broadside, with dividing bulkheads and 2·8 in. shields, and two in sponsons on the spar deck. There are also eight 3·9-in., sixteen 1·88-in., and ten 1·46-in. quick-firers, besides eight machine guns distributed on the upper deck and in the tops of the two fighting masts. The heavier guns can be worked either by hydraulics or electricity. The torpedo tubes are four in number. Protection is given by an end-to-end steel belt, 6 ft. 7 in. deep, and 15¾ in. thick amidships, this thickness tapering off to 10 in. at the lower edge. The belt is surmounted by a cofferdam, closed in with 3-in. hardened steel plates. The steel deck, 3 in. thick, is at a level with the upper edge of the belt, and there is a 1½-ins. splinter-proof deck below, the intermediate space being subdivided by bulkheads and fitted for the storage of coal. The machinery will consist of vertical triple-expansion engines of 14,500 I.H.P., with forced draught in the stokeholds, driving three screws and giving an anticipated speed of 18 knots. Steam is to be supplied by Belleville boilers. The quantity of coal stored under normal conditions is 677 tons, but in case of emergency as much as 1,000 tons can be stored on board. The *Saint Louis* is a sister ship to the *Gaulois*, which is to be launched at Brest on October 6th, and to the *Charlemagne*.

Pigeons for new purposes.

The use of pigeons as messengers from the ships to the land has long been urged upon our naval authorities and at length with some degree of success, but it is in Italy probably that experiments in this direction have been most completely carried out. During the Italian manœuvres special installations were carried in the *Sicilia* flagship on one side, and in the *Umberto* on the other, as well as in the *Savoia*, which was the flagship of the Duke of Genoa, the Commander-in-Chief. In all 80 birds were taken afloat, and the management of them was entrusted to military subalterns who had been associated with the handling of them ashore, assisted by petty officers of the ships. Full details of the use of the pigeons have not yet been made public, but it is known that successful trials were made, one from the *Sicilia*, at Maddalean, to Rome in 15 hours, another from the same ship between Vado and Caprais, and two from the *Savoia* between Elba and Monte Argentorio. The hen birds are found to fly more swiftly for short distances, but their mates, being of stronger build, answer better for longer flights. It is the practice to feed the birds about two hours before sending them up. Rough weather or the presence of birds of prey will cause them to deviate from the passage they should make or delay them, but under favourable circumstances they have been known to fly as fast as 48 miles an hour. The message is written upon thin paper rolled within a light goose quill which is sealed at the ends and attached to the body of the bird. A record is kept of the age and parentage of each bird and of its performances, so that individual ability is studied to the advantage of the service. Five birds are usually thrown up at the same time. Now that the instructional destroyers in the Channel are to take pigeons with them to sea, it will soon be possible to learn if the birds bred at Portsmouth and Devonport are as clever and useful as their Italian cousins.

Sheerness Dockyard.

The trials of the *Pelorus*, third-class cruiser, will commence on October 1st. In addition to the natural draught and forced draught trials, there will be a 30-hours coal consumption trial. These trials will be of general interest, first because the type of ship is altogether new, and secondly for the reason that the *Pelorus* is fitted with water-tube boilers supplied by Messrs. J. and G. Thomson, of Clydebank. Five similar vessels are building by contract and will be named the *Pactolus*, *Pyramus*, *Prometheus*, *Persæus* and *Pegasus*, while a sixth is to be laid down at Sheerness and named the *Pomene*. A seventh, the *Proserpine*, as already reported, is building here. The *Proserpine* is to be ready for launching in November. The gunboats *Sheldrake* and *Niger* are still in hand, but the former is to pay off and go to Devonport to be fitted with water-tube boilers. The *Sans Pareil* is to be taken in hand here for refit. We have had a large accession to the instructional flotilla which gives extra work, but the damage to the *Landrail* has now been repaired and this vessel returns to her duties. The *Champion*, of the Training Squadron, has been added to the ships under refit.

Pembroke Dockyard.

The Commander-in-chief at Plymouth has visited this yard on a tour of inspection, and is reported to have been very favourably impressed with the progress made on the *Hannibal* and *Andromeda* and the general work going on. The *Thunderer* has been removed from her moorings off the dockyard to the Wear, as it was thought that there was a possibility of her breaking adrift and going on the rock which was discovered when the *Bellerophon* was in the harbour. Some delay has been caused in the manufacture of the machines of the *Hannibal* by the Belfast strike, but it is believed that they will be delivered in good time or as soon as the ship is ready for them. The *Hannibal* is occupying the labour of a good many men and there is no reason to anticipate that she will not be able to make her trials at the date fixed. The *Andromeda* is being advanced with unusual activity. She will be ready for launching in January next if the number of hands now employed on her are kept at work. There is, however, some reason to suppose that another cruiser will be laid down here before the end of next year, and this if done may interfere with her progress.

NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from August 27th to September 24th, 1896:—

Amor, Edward R.†
Attwool, George, engineer to the *Sparrow*, additional for recommission, to date September 15th.
Baker, J. G. L., chief engineer, has been advanced to the rank of staff engineer in Her Majesty's fleet.
Barry, George W., staff engineer to the *Vivid*, additional for the *Forth*, to date September 11th.
Bench, George E., staff engineer to the *Vivid*, additional for the *Furious*, to date September 16th.
Bramsdon, William H, staff engineer to the *Howe*, to date September 11th.
Carter, Edgar O.*
Collins, Archibald H., (probationary) assistant engineer to the *Repulse*, to date August 27th.
Cossey, Arthur E., (probationary) assistant engineer to the *Magnificent*, to date September 15th.
Croisdale, Louis R.†
Dalrymple, John H., engineer to the *Trafalgar*, additional for the *Rattlesnake*, to date August 29th.
Dawson, William*
Dupen, Arthur P. L., engineer to the *Widgeon*, additional for recommission, to date September 15th.
Durston, Arthur S. W.*
Ellis, W. A., staff engineer on the retired list, has been advanced to the rank of fleet engineer on the retired list.
Emdin, Archie R., engineer to the *President*, additional for service at the Admiralty, to date August 27th.
Fletcher, Frank A.*
Greetham, Charles T. D., engineer to the *Seahorse*, to date September 11th.
Guyer, Thomas S., engineer, to be lent to the *Starfish*, undated.
Harding, Charles A.†
Ham, William H.*
Hammond, Cyril E. J., assistant engineer to the *Alexander*, additional for the *Spanker*, to date September 15th.
Harris, Herbert W., engineer to the *Victory*, additional for the *Prince George*, to date August 27th.
Hastings, Alfred J.*
Hender, William J., engineer to the *Plassy*, for the *Rattlesnake*, to date August 29th.
Huddy, J. B., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.
Hyne, Arthur E.*
Jenkins, John C.*
Keppel, Walter G.*
Kerr, Alexander, chief engineer to the *Melpomene*, to date September 15th.
Kerswell, George T., engineer to the *Pembroke*, additional for the *Cynthia*, to date August 27th.
Kirwin, Joseph J.*
Liversidge, Henry T., engineer to the *Speedy*, to date August 28th.
Liversidge, John G., engineer to the *President*, additional, for service at the Admiralty, to date August 27th.
Lock, Henry J., fleet engineer to the *Black Prince*, additional for torpedo store, Devonport, to date September 11th.
Loveridge, Henry J.†
Maconochie, Archibald W.*
Marrack, Philip, chief engineer to the *President*, additional for service at the Admiralty, to date August 27th.
M'Gregor, David J., (probationary) assistant engineer to the *Flora*, additional for training, to date September 15th.
Moorshead, John E., engineer to the *Flora*, to date September 15th.
Morrison, Frank*
Mowlam, Ernest J.*
Nicholls, Harry E. (probationary) assistant engineer to the *Melampus*, additional for the *Gossamer*, to date September 15th.
Pallett, William H., engineer to the *Victory*, additional for the *Violet*, to date August 28th.
Parry, Herbert L.*
Paterson, George T., acting engineer to the *Australia*, to date August 27th.
Pedrick, John R. J., staff engineer to the *Anson*, to date September 11th.
Pullot, Elias G., (probationary) assistant engineer to the *Empress of India*, to date September 15th.
Purkis, Joseph T., staff engineer to be detailed for duty in Europe.
Rawlingson, Walter W. H., engineer to the *Victory*, additional for the *Rattlesnake*, to date August 29th.
Reynolds, Harry E. J., assistant engineer to the *St. George*, additional for the *Spanker*, to date September 15th.
Rundle, R. T., fleet engineer has been placed on the retired list of his rank.
Ryan, William, engineer to the *Victory*, additional for the *Beagle*, to date September 11th.
Screech, Samuel A., chief engineer to the *Victory*, additional for gun and torpedo boats, to date September 11th.
Shirvell J., staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet.
Sillince, William P.*
Simmons, Fellowes T.*
Stearn, Walter T., engineer to the *President*, additional for service at the Admiralty, to date August 27th.
Stevens, Charles, engineer to the *Magnificent*, to date August 27th.
Stuart, Malrin, engineer to the *Vivid*, additional to the *Edgar*, to date October 1st.
Sydenham, Ernest D.*
Thorne, Charles W., fleet engineer to the *Calypso*, to date September 16th.
Webb, Arthur T., engineer to the *Melampus*, for the *Gossamer*, to date September 15th.
Weeks, Edward J., engineer to the *Pembroke*, additional for charge of, and to account for, stores of Reserve at Sheerness and Chatham, to date September 9th.
Westaway, Albert E. L., chief engineer to the *Flora*, to date September 15th.
Westbrook, Walter S., engineer to the *Inflexible*, to date September 11th.
Wheeler, Richard J., fleet engineer to the *Defiance*, additional for torpedo store, Devonport, to date September 11th.
Willmore, Herbert H., (probationary) assistant engineer to the *Melpomene*, to date September 15th.
Wright, John R. B., fleet engineer to the *Trafalgar*, additional for torpedo store, Devonport, to date September 11th.

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* Probationary † assistant engineer to be lent to the R.N. College for a *course* of study, to date September 30th, and to join college on the same day.

HOAR & BROWN'S HARDWOOD MARKET REPORT, SEPTEMBER 22nd, 1896.

TEAK.—	Logs. Loads.	Planks. Loads.	Blocks. Loads.	Total. Loads.
Stock, 1st Sept.	8,734	2,480	109	11,323
Landings	1,930	295	3	2,228
	10,664	2,775	112	13,551
Deliveries	980	346	—	1,326
Stock, 17th Sept.	9,684	2,429	112	12,225

The late advance in values shows no decline, and great firmness is displayed with regard to cargoes afloat, the prices now asked exceeding those of the previous month. Landed stocks are fairly heavy considering present requirements, although a considerable quantity of the wood now here has been sold, and will be delivered gradually. Most of the cargoes for forward delivery are consigned to one firm, so may not be pressed upon the market as in previous instances when prices have similarly risen.

The plank trade, although quiet this month, has shown an upward tendency in values, and shippers are putting up their prices on each parcel arriving, about 2½ per cent., making business now quite difficult.

Although the floating quotations for logs are now £12 10s., and planks £11 5s., there are stocks of the former to be had as low as £9 10s., and planks at £10 per load.

MAHOGANY.—The market is under the influence of a depression, and in the case of some holders a hurried clearance is being made, consequent upon rumours of large shipments shortly to arrive, mostly from Honduras. Should much stock be thrown upon the market at one time, we may look for a considerable subsidence in prices, as business at this time of the year is very restricted, and consumers are nervous about stocking at present high figures. There is a fair quantity of Cuba wood about, but mostly held by one broker, which fact may have the effect of preventing any wholesale sacrifice in this direction. Of Mexican there are some cargoes about to arrive, and a fair stock now landed. African is also well represented, and with the new season's cuttings small stocks are unlikely to predominate.

CEDAR.—The market is pretty full, and it is reported that some of the holders have already tried to clear their stocks at a considerable reduction on prices lately ruling. A decline appears almost certain.

WALNUT.—The late advance has slowly given way, and prices now remain much as they were twelve months ago. The quantity here being unusually large, we may see the minimum figure again ruling until such time as imports are curtailed.

WHITEWOOD keeps much as it was, and the market, while carefully fed, is likely to remain firm.

OAK.—There is plenty of stock, and prices are low.

KAWRIE PINE.—Two or three shipments have lately arrived, but the same values are kept up, being just enough to show a small turnover to the shippers.

SEQUOID.—The dock stock is very small, but there is enough to meet the poor demand. It is known that a large consignment is close at hand, which will be ample to supply consumers for many months.

GREENHEART.—Just lately stocks have increased, and prices have worked down a little. But few retail enquiries are met with in London, and trade has been in that respect dull. Some orders have been taken direct for pier and dock work.

PADOUK.—Holders of this wood have not been busy, the consumption being most limited. Prices, however, remain unchanged, but accruing charges will tell upon the stocks.

SABICU.—Some few orders have passed, and stocks are reduced a little, but business may be described as slow. Prices have not fallen, as there is not much here.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(From our own Correspondent.)

IT is with pleasure that we are enabled to announce that Messrs. Dunsmuir & Jackson's engineers, who have been on strike for five weeks, returned to work on September 8th, thus averting the threatened general lock-out of the members of the Amalgamated Society of Engineers on the Clyde, Tyne, Tees, Wear, Hartlepool, Barrow and Belfast. The notices, which were posted up by all the federated employers on September 2nd, read as follows:—

"The Employers' Federation of Engineering Associations. Notice.—In consequence of the continuance of the strike at Messrs. Dunsmuir & Jackson's, Govan, Glasgow, of a section of the members of the Amalgamated Society of Engineers against the employment of non-union labour, and the failure of the Society to fill the places of those on strike, or to induce the men on strike to return to work, notice is hereby given that on Saturday, September 12th, and on each of the three succeeding Saturdays, the services of 25 per cent. of the members of the Amalgamated Society of Engineers at present employed in these works will be dispensed with.

"This notice does not apply to non-union men nor to members of other societies.

"By Order."

The first pay-off would have affected about 5,000 society engineers alone, and if, as they threatened to do, all had gone on strike at the same time, it would have meant something like 30,000 men idle. It was a serious responsibility for a handful of men, even backed by its district committee, to assume; but there was a feeling that the central council would prevail.

The men resumed work, not only alongside the non-unionist, but with another who had been engaged during the strike. Thus the employers have demonstrated their right to freedom in regard to whom they shall employ, and that is what they have all along contended for. Messrs. Dunsmuir & Jackson take up the position that they have made no compromise. Cook, the non-unionist, it is stated, has secured a place in London, which he left for a week after the men resumed work, the other man had intentions which were satisfactory to the men. Originally the strikers numbered about seventy, but their ranks were reduced by several going to sea, and a number securing good positions in other shops ashore, so that the strike roll contained only about forty names.

That a satisfactory conclusion to the difficulty has been arrived at is in great measure due to the tact and patience of Mr. George Ferguson, the organising delegate of the society in Scotland, who, amid all the distractions of the situation, has worked steadily for peace. His position was exceedingly difficult. On the one hand was the executive committee of his union urging him to get the dispute settled at any cost; on the other were the men, stubborn in their attitude, defying the officials at headquarters, and encouraged thereto by the procedure of the district committee, whose first declared position of neutrality implied sympathy with the strikers. The idle men were supported, not only by the sympathy, but by the substantial financial aid of their fellow-tradesmen, who seemed not only ready, but eager for a strike when the lock-out notices were issued.

The industry was on the brink of civil war. Indeed, at one of the Glasgow District committee meetings, a proposal was made that all the men should leave their work next morning. Had it have gone to the vote it would have easily been carried. Fortunately the committee was induced to adjourn without coming to a decision, and, before their next meeting, Mr. Ferguson had, on his own initiative, resumed the negotiations which have had so satisfactory an issue.

The sub-committee of the Engineering Employers' Federation met on September 9th in Glasgow, and formally decided to withdraw the lock-out notices posted on the 2nd. The new notices were issued late the same evening and were posted alongside the original announcements. A circular explaining the action taken by the Executive Board was also despatched to the firms in the Federation.

The Clyde Shipbuilding Employers' Association, at a meeting in Glasgow on Tuesday, September 15th, considered several labour questions, the most important of which were the increase of wages to the "black squad," and the demand of all the trades employed in the shipbuilding departments for weekly pays. As has been announced, the employers agreed to concede the five per cent. asked, and the only thing left for adjustment was the date on which the increase should come into force. The Iron Shipbuilders' Society wish to make the increase as from the first pay in November, and the Employers' Association a month later. The matter is still under consideration. The weekly pays question is, however, in a less satisfactory position. The demand is made by all, and to it a reply is requested before 25th October. The employers decided to decline to accede to the request. Payment of wages weekly would mean a very large increase in office expenditure, but even if that were not the case, the disinclination of piece-workers to resume on the Mondays after pays under the existing arrangement seriously involves the question. If after weekly pays they "lay off" to as great an extent, firms would not only have to face increased expenditure, but the loss in keeping machinery going for nothing like full staffs would be very much greater. As yet the question is not very serious, but any day it may be.

Shipbuilding has not been particularly busy during the past month. Orders are few. In a few cases, indeed, vessels are being built on "spec." This is true of Messrs. Robert Duncan & Co., who have arranged to put down a sailing vessel of about 3,500 tons deadweight, simply to keep apprentices and old hands in employment, but with the labour troubles settled, inquiries should take a more business-like turn. Tenders have been prepared by Clyde firms for a new paddle steamer for Messrs. J. & G. Burns, to be employed in their daylight service between Ardrossan and Belfast, which will be larger and faster than their well-known steamer *Adder*. Tenders are also being asked for a new cross-channel screw steamer for the Clyde Shipping Co. Several shipbuilding firms in the Clyde district have also tendered for the construction of a battleship of 15,000 tons displacement, and a cruiser of 6,500 tons for the Spanish navy. The Spanish Minister of Marine has virtually, it is stated, decided to accept the tender of a Clyde firm for both vessels.

The applications for the vacant post of secretary to the Institution of Engineers and Shipbuilders in Scotland, rendered vacant by the retirement of Mr. W. J. Millar, C.E., numbered no fewer than 130, but a sub-committee of the council on September 1st reduced the list to two candidates, and on Monday, September 7th, the appointment fell to Mr. E. H. Parker, who for the last fourteen years has been employed in the ship model testing department in connection with Messrs. Denny & Brothers' shipyard at Dumbarton. Prior to entering Messrs. Denny's employ Mr. Parker served under Mr. Froude in the experimental tank at Torquay, an establishment which suggested the lines on which Messrs. Denny's tank has been laid down and conducted, and the forerunner of the larger establishment of the same kind presently presided over by Mr. R. E. Froude on behalf of the Admiralty at Haslar. The salary attached to the office is £300 per annum, and we understand that a retiring allowance of £100 to Mr. Millar for the next five years has also been arranged for. The second on the list was Mr. Magnus Maclean, B.A., the well-known demonstrator in the Andersonian College at Glasgow.

The Clyde Lighthouses Trust since the construction of their gas manufacturing works at the Mirren shore, Port-Glasgow, have done much during the past decade to make the navigation of the river by night more easily accomplished than it formerly was. Quite recently a group flash light—the first of its kind in Britain—was substituted in the Perch Lighthouse, immediately opposite Port-Glasgow, for a stationary light, which, on account of its nearness to the shore, had proved deceptive both to outgoing and incoming steamers. At the same time an occult light, supplied with gas from a tank in the buoy upon which it is placed, was fixed on the opposite side of the channel, showing the fairway plainly at this bend in the navigable portion of the river. The Trust are now making arrangements to lay down a complete series of gas-lighted buoys between Greenock and Port-Glasgow, every alternate buoy to be lighted.

Messrs. James & George Thomson, Limited, launched from their yard at Clydebank, on August 28th, a torpedo-boat destroyer of 380 tons, to the order of the Spanish Government. The vessel was named *Terror*, and is a duplicate of the *Furor*. The *Quail* and *Sparrowhawk*, two torpedo-boat destroyers built by Messrs. Laird & Co., at Birkenhead, have now been fitted with new propellers by Messrs. Scott & Co., Greenock.

Messrs. Robert Duncan & Co., Limited, Port-Glasgow, have laid down the keel of a sailing ship, which will be capable of carrying 3,600 tons deadweight.

Messrs. Chambers Brothers, boatbuilders, Greenock, are building for a Glasgow gentleman a steam yacht, 66 ft. in length, to be as nearly as possible a duplicate of the one recently ordered by Major Reginald Turner, Switzerland.

Messrs. Blackwood & Gordon, engineers and shipbuilders, Port-Glasgow, have, it is announced, arranged with the City of Dublin Steam Packet Co., of Dublin, to build and engine for them a steel screw steamer for the passenger and cattle trade, a duplicate of the steamer *Carlow* completed by them three months ago. This steamer will be the fifth vessel that Messrs. Blackwood & Gordon have built for the same company, and will be employed in the cross-channel trade between Dublin and Liverpool.

Mr. Montgomery, engineer, Greenock, has secured the contract to supply engines for the yacht at present building by Messrs. Chambers Brothers for Major R. Turner. She is expected to be ready in October. He has also contracted to supply the engines and boiler for a new yacht 66 ft. long at present building by Mr. Thomas Orr, Greenock.

Messrs. J. G. Rowan & Co., Greenock, have lately secured the contract to supply the upholstery for the two mail steamers at present being built by Messrs. Barclay, Curle & Co., for the Castle Line.

Messrs. Wm. Simons & Co., Limited, Renfrew, have received an order to construct a powerful barge-loading dredger for the Corporation of Bristol.

Messrs. Ramage & Ferguson, Limited, Leith, have received an order for a first-class steam yacht of 310 tons, to be built from designs by Mr. St. Clare Byrne, Liverpool.

At Bogolowsky, in the Government of Perm, Russia, there have lately been completed new iron and steel works, comprising four blast furnaces, three Martin steel furnaces, a large rolling mill, an engineering shop, and ironfoundry.

TRADE NOTES FROM THE TYNE, WEAR, TEES, HARTLEPOOLS, &c.

(From our own Correspondent.)

THE TYNE.

Shipbuilding.—An increased demand for shipping, and a consequent advance in freights are, at the moment, the most important features that are to be noted in connection with trade movements. This is a change which has been long looked for, and it must surely bring a balm to the spirits of investors in shipping property throughout the country, after the trying time of unprofitable trading through which they have passed. We have always expressed the view that a rise in freights must be the necessary preliminary to anything in the way of a real improvement in the shipping and shipbuilding trades, and now that this condition has at last been established, we cannot help but feel a considerable amount of confidence in the future. Should the rise in freights be maintained—as there is reason to hope it will—a stronger demand for new tonnage is pretty certain to arise in the near future, and it is in the highest degree probable that the year 1897 will open with a larger account of occupied building berths, throughout the various centres of the United Kingdom, than any year since the beginning of the decade. At the opening of 1894 there was an upward move in shipbuilding and cognate industries, which some people dignified by the name of a revival. It was short-lived however; for on the first symptom of recovery, labour became restive, and the supposed revival quickly shrunk back and gave place to the dead level of dulness which had previously characterised business. It is to be hoped that when trade again shows tangible evidences of growing strength, the workmen and their responsible advisers will exercise a judicious restraint upon their desire for larger remuneration, until demand enhances price. When shipbuilders and engineers are able to secure higher prices for their products, they will not, we are sure, have the least objection to let the operatives participate in the advantage.

It is stated, on what appears to be good authority, that Messrs. Armstrong, Mitchell & Co. have been successful in obtaining from the Spanish Government a commission to build a battleship and a cruiser. The battleship is to have a displacement of 11,000 tons, is to cost £900,000, and is to be delivered in 14 months, while the cruiser, which is to cost £600,000, will have a displacement of 6,500 tons, with a speed of 21 knots, and is to be built in 12 months. As the company have a large amount of other work on their order book, not to speak of the vessels in progress, it will be seen that the two additional building berths which are being prepared are likely to be needed. It is to be regretted that the efforts of the directors to keep the establishments at Elswick and Low Walker well supplied with work should be continually thwarted by the inconsiderate action of the workmen. At the present moment the progress of work at the company's Low Walker yard, where there are four cruisers laid down, is seriously hindered by a dispute between the drillers and boilermakers, as to which shall do the work of putting in "tap-bolts." The drillers have had this work for many years past, and their right to it has never been questioned till quite recently, that is to say, till the construction of the war-ships had reached a stage when the "tap-bolts" being used were largely multiplied, as compared with the number used in merchant ships, which previously had constituted the regular work of the yard. The boilermakers then seemed to have awakened to the fact that the fixing of "tap-bolts" belonged exclusively to themselves, and they emphasized their belief in this theory by going out on strike. This was early in September, and it may be stated that the strike did not last long, the men being induced to return to the general work of the yard, on the understanding that the particular work of "tap-bolts" should not be proceeded with until the question of "exclusive right" was settled by negotiation or otherwise. The question is unfortunately still unsettled, the boilermakers being apparently indisposed to accept any kind of arrangement which does not give them absolutely and unconditionally what they demand. The result is that other work is now stopped, as well as the putting in of "tap-bolts," and the construction of the cruisers—all of which are for foreign Governments—is seriously delayed. Should the delay have the effect of preventing other orders being placed at a future date, the men will only have themselves to blame for any diminution of employment that may ensue.

That the Palmer Shipbuilding and Iron Co. have made a distinct advance under the new managerial arrangements which were initiated a couple of years ago, is made plain by the report of the company's transactions read at the annual meeting of shareholders, which took place about the middle of the month. This report discloses the important and interesting fact that a profit has been realised on the year's working, and though a small one, the very fact of its existence gives promise of larger results in the future, when the reconstituted directorate shall have had time to bring to full fruition their projects of improvement and development. Besides the ten war vessels in hand, the company have some exceptionally important merchant vessels on the stocks and in the river, and the aggregate number of workmen employed throughout the various departments of shipbuilding, engineering, iron-making, including blast furnaces and steel-making, including rolling mills, is considerably in excess of the total employed at any former period. It is now authoritatively announced that the company are about to add to their other undertakings the manufacture of cycles and motor cars, and as they have a spacious, well-lighted building ready to their hand, the new departure should have a large measure of success.

Messrs. Wigham Richardson & Co. have obtained an order for a superior type steamer from the Kosmos Co., Hamburg, for whom they have previously built vessels that have given great satisfaction. They have in hand several other high-class vessels, ordered by foreign owners, and the yard continues exceedingly busy. The finely designed and elaborately equipped steamer *Innisfallen* has been delivered to her owners, the Cork Steam Packet Co., and has since attracted much attention on account of her exceptionally handsome appearance.

The new Wilson's-Leyland-Furness amalgamation has placed an order with Messrs. C. S. Swan & Hunter for a vessel of considerably over 12,000 tons carrying capacity. This will form one of the new fleet of first-class steamers, which is being built for the service of this new and powerful shipping partnership. Representatives of the company visited Messrs. Swan & Hunter's yards at Wallsend a few days ago, and on being shown through are said to have expressed great admiration for what they saw, and especially for the recently constructed covering sheds, under one of which the newly ordered vessel is to be built. Messrs. Hawthorn, Leslie & Co. have one or two berths vacant, but there is so far nothing to complain of in the way of slackness in any of the departments. Messrs. Robert Stephenson & Co. are still without orders for ships, but they continue to do a fair business in the construction of dock gates, and similar work. The Tyne Shipbuilding Co. are reported to have sold to a local company one of the large steamers at present on their stocks. The Edwards Shipbuilding Co. have some eight or ten barges in course of construction at their Howden yard, and a large number of men are employed. At Messrs. Readhead's yard the briskness previously noted is fully maintained. The Wallsend Slipway Co. have two Liverpool steamers under repair. One of these is at present in the company's large graving dock, where a considerable portion of the shell-plating is being renewed. The interior fittings are also receiving attention. Graving docks at North and South Shields are at present mostly occupied with vessels being repaired or painted, and at other places on the river a considerable amount of repairing and renovating is also being done. There is little doing in the building of ships' boats, steel boats being now more in favour than those made from the more primitive material—wood.

Engineering.—During the earlier part of the month the possibility of a great lock-out of engineering operatives on the North-East Coast greatly occupied the minds of business men in this district, and was for several days the general topic of conversation. Much anxiety was felt lest the dreaded event should take place; for it was well known and fully understood that in that case a general dislocation of trade would take place. The question at issue was one of vital interest, namely, whether employers should or should not exercise the prerogative of employing whom they pleased. The matter was set going by an effort made on the Clyde to force a firm of engineers to discharge a non-union workman, and had not this arrogant demand been at the eleventh hour withdrawn, the feared lock-out on the Tyne, and at other centres, including the remainder of the Clyde, would undoubtedly have taken place. As it is, we fear the battle has only been postponed; for unless the engineers and other bodies of trade-unionists abandon their opposition to the employment of non-unionists, the struggle which will finally settle this question must surely come. It cannot long be permitted that irresponsible persons shall in a sense usurp the management of work, by practically selecting the men to be employed. The man who pays is he who has the right to chose, and if trade-unionists will not, by the exercise of their own good sense, recognise this honest and universally applicable principle, the recognition of it will ultimately be forced upon them, to their own great injury and loss.

The Wallsend Slipway and Engineering Co. have booked another important order this month, namely, the engines and boilers for the 12,000-ton steamer to be built by Messrs. Swan & Hunter. This ship will have among other special accessories a bronze propeller, and the power of the engines may be inferred from the fact, that the diameter of this indispensable appendage, will be 20 ft. At the other marine engine works business is good, and locomotive works show considerable improvement since midsummer. The works of Messrs John Abbot & Co. are well employed, and the recently issued account of the company's transactions shows that, in spite of many impediments, business during the last financial year was fairly prosperous.

Messrs. Carrick & Wardale have brought out an improved ship's pump, which they are now putting on the market with great success. The speciality is called the "Patent Duplex Slide Valve Pump," and has some new and interesting features which merit the attention of experts. The Combination Metallic Packing Co., Lombard Street, Newcastle, are just now particularly busy, their speciality being greatly approved for the engines of warships and high-class merchant vessels. They are also having a good demand for Hedley's Mechanical Lubricators, of which they are sole proprietors. Messrs. The Bell's Asbestos Co., Limited, have introduced a new packing which they have called the "Demon." The metal and asbestos in this packing are combined in a special manner, secured by patent rights, by which, it is claimed, the objections against using metal and asbestos in alternate layers, which is customary in engine packings of this description, are entirely overcome. It is also claimed that the packing is particularly well suited for marine engines, that when in position it requires neither attention nor renewal for an unprecedentedly long period, and that no other packing combines efficiency with durability in an equal degree. Mr. W. F. Snowdon, No. 2 Side, is the agent for Newcastle and district.

Blyth.—The Blyth Shipbuilding Co., Limited, have at present two vessels in course of construction, one of which—of 5,000 tons carrying capacity—is ready for launching. The firm are very well off in repair work, having three vessels in hand. The Blyth Dry Dock Co. are also well supplied with work, and satisfactory progress is being made with the construction of their third dock, which is to be 475 ft. in length.

Notwithstanding the opening of the new coal shipping staiths this branch of trade is at present somewhat quiet, but that is unfortunately a feature of the coal trade at all centres, and there is no reason to doubt that, when business revives, Blyth will get its share.

THE WEAR.

Shipbuilding.—It is strange, but nevertheless true, that the shipwrights who, five or six months ago, obtained a substantial advance of wages on the plea that their number was short of the demand have now reached the other end of the pole, and are largely in excess of requirements. On the Wear alone there are nearly 300 men of this class out of work, and it is reasonable to infer that there is an over-supply in other districts, or the Sunderland men would quickly be drafted away. If the employers were of the grasping nature that they are often described to be they would doubtless demand the return of the advance they gave in the earlier part of the year, but as a matter of fact they have more magnanimity than they get credit for, and there is little fear of their "rounding" on the shipwrights or any other class because of a temporary change in the condition of the labour market. At all events there is a lesson in moderation given if the workmen choose to profit by it.

We regret to note that the yard of Messrs. J. L. Thompson & Sons, which for years has held the leading place, both for briskness and output among the yards of the Wear is still slack, and that there does not seem to be much prospect of an early return to the condition of activity which previously characterised the establishment. There are, it is true, three vessels on the stocks—enough to make most other yards busy—but this amount of work does not sustain the traditions of the yard in question, which possesses space and facilities for dealing effectively with twice the quantity of work.

Mr. James Laing has received, from the Anglo-American Oil Co., an order for a steamer of 11,000 tons capacity, which will be the largest oil-carrying steamer afloat, and has also in progress a large steamer for the British India Steam Navigation Co., besides other work of an important kind. At the yard of Messrs. Robert Thompson & Sons, where there are two vessels in advanced stages on the stocks, the keel for a third vessel, to be 320 ft. long, and 47 ft. wide, is being laid.

Messrs. Short Brothers are laying down electrical plant to drive the greater part, and subsequently—it is expected—the whole of the machinery in the shipyard, as well as in the adjoining premises, which the firm have taken, for repairing and fitting-out work. The installation, which is being carried out by Messrs. Selby Bigge & Co., electrical engineers, Newcastle, will, it is understood, be very complete.

At Messrs. Doxford's business continues active, but at the other establishments above bridge, to which special reference is not made, slackness is the rule.

Messrs. John Priestman & Co. launched, on the 21st inst., the "patent self-trimming" steamer, *Unique.* As its name implies, the vessel is entirely out of the common order, being designed especially to combine qualities which, when shown to exist, must prove her a very valuable cargo-carrying medium. The distinctive feature of the design is a central raised deck, flanked by sloping decks, which reach to the vessel's sides, and have narrow platforms at top and bottom to facilitate navigation and working. The vessel also has capacity, in addition to the ordinary water-ballast tanks below the bilges, for taking supplementary ballast when necessary, in spaces under the platforms beside the central deck. The vessel is of the ordinary shape at the forward and after parts, and the admixture of old and new styles, instead of appearing in any way incongruous, looks exceedingly well. The vessel is owned by Messrs. Rōld McNair & Co, of Glasgow, the contract having been arranged by Mr. Martin Cohn, of Sunderland. The machinery will be supplied by the North Eastern Engineering Co., Wallsend.

Engineering.—The machinery of the large oil ship, recently ordered from Mr. Laing, is to be supplied by Messrs. John Dickenson & Sons, while that for the British India boat in course of construction at the yard of the same builder, will be turned out from the works of Messrs. George Clark, Limited. The state of business at the North Eastern Engineering Co.'s works, South Dock, has improved considerably within the past few weeks, and the same may be said in reference to the engineering department at Messrs. Doxford's Works. The Scotia Engine Works (Messrs. W. Allan & Co.) are, at the moment, not particularly busy. At most of the local foundries business is satisfactory; but in the forges there is little doing. Brass and copper works are fairly busy, whilst at the only iron rolling mills in the district work is more regular.

Mr. Robert Welford, Pallion, is introducing a new cargo drum for ships' winches, which appears to possess very exceptional merits. It is claimed that winches fitted with these drums are capable of working cargo in half the time usually occupied with existing whipping arrangements, and with much less wear and tear. We hope to give fuller details respecting this speciality in a future number.

The Hartlepools.—Messrs. Furness, Withy & Co. are among the firms commissioned to build for the new Wilson's-Leyland Furness Co., and in this case, we understand, the vessel to be built will be 490 ft. long, by 54 ft. in width. This is the vessel referred to in our Trade Notes last month; but we were not then able to give particulars. The engines for this vessel will be supplied by Messrs. Thos. Richardson & Sons. At the Central Marine Works business has been very quiet for some time past, and what is quite unusual at this establishment, there has been but one trial of ships' machinery since the early part of August. This is not a concern however which is likely to remain long inactive, and we do not doubt that a better state of business than now exists will soon be apparent. At the docks trade is brisk, timber imports continuing to be numerous.

Stockton.—The outlook for shipbuilding at this centre is more hopeful, and it is reported that one or two orders for vessels have been recently placed. Messrs. Ropner & Son are among the number of shipbuilding firms who have ventured upon the path of innovation in design, and are now introducing a new type of vessel for which special advantages are claimed. Messrs. Blair & Co. continue to be well employed, and at other engineering works, boiler works, &c., signs of improvement are not wanting. Steel works are kept going steadily, and the prices of plates and angles for shipbuilding purposes remain firm.

Middlesbro'.—The state of the shipbuilding industry at this centre has undergone no material change, though it is understood that the leading firm has recently secured an addition to the order-book. In the engineering establishments business is fairly good, and steel works continue busy.

Darlington.—At the works of the Darlington Forge Co. a very active business still prevails, some of the orders in hand being exceptionally important.

THE MERSEY.

(From our own Correspondent.)

ACTIVITY is well maintained in all branches of the engineering trades connected with the marine industries, and all through the general engineering departments shops are fully employed, with new work coming forward steadily, and in sufficient quantity to keep the establishments well engaged for some time to come. As previously reported, the wages question is just now the only disturbing element in the present satisfactory position of the engineering trades. For some time past there has been a gradual upward move in the lower-paid districts, the last important concession being the granting of an advance of 2s. per week to the men employed in the engineering shops of the Bolton district, and as intimated last month, the movement has now extended to Manchester. The circular requesting an advance—of which an abstract was given last month—was brought before one of the most influential meetings of engineering trades employers which has ever been held in the Manchester district. After a full discussion of the matter, a reply was drawn up, which, after pointing out that the hours of labour had been reduced; that the wages in Manchester were considerably higher than in most other competing districts; that during the recent depression wages were not reduced, whilst the employers had to submit to low and often unremunerative prices; that though trade is now active, the prices obtained for much of the work done left but a small margin of profit; and that sufficient time had not elapsed to test whether higher prices could be obtained, or to compensate employers for loss of profit during the period of depression, stated that it had been decided by the employers that in the best interests of both employers and employed, a general rise of wages was not justified, would be inexpedient, and could not, at the present time, be conceded. This resolution was formally communicated to the joint committee, representing the workmen, and a reply on their behalf was forwarded to the employers, to the effect that they regretted that the masters had not seen their way to grant the advance asked for, but before resorting to extreme measures, they would ask them to reconsider their decision, a reply being requested by the 22nd September. This circular, after being considered at several meetings of the committee, representing the Iron Trades Employers' Association, was brought before another general meeting of the employers, representing the whole of the engineering trades of the district, held on Tuesday last, when, after a long discussion, the following resolution was signed by all the representatives of engineering firms present, and forwarded to the joint committee representing the various engineering trade union societies, from whom the application for an advance had been received:—"We, the undersigned, employers in the engineering trade of Manchester, hereby acknowledge the receipt of your circular of the 12th inst., in reply to our letter of the 8th, and while regretting that you take exception to the tone of this letter, we note that no attempt is made to disprove any of the statements therein, or to question any of the arguments advanced by us for your consideration. Nothing has occurred to alter our views as therein expressed. We may, however, add, that while we have no desire, even if we had the power, to prevent labour receiving its fair share of any lasting prosperity that may fall to our trade, we must protest against any attempt to raise the rate of wages now, and so, just because the engineering trade has been brisk all over the country for a few months, saddle our district with a still higher rate than others. In some branches of our trade Manchester only becomes busy when cheaper districts can take no more work. We would ask, how can our local trade, with all its enterprise and capital, live at all against such odds? If it is killed, who will suffer most? There was once undoubtedly a money value both to capital and labour in the word 'Manchester,' but this has almost ceased to exist in the face of altered circumstances. If it now has no extra money value to capital, it ought not to have any to labour. Whatever value may remain should be cherished by both parties as a valuable heirloom, to be shared by both, and not lightly destroyed by any ill-considered action, or by disputes as to which shall enjoy it exclusively. To the masters it should mean safety of capital and steady profits, and to the men continuity of employment at fair wages. We feel convinced that if labour now succeeds in asserting a contrary view, the trade will be entirely driven away. Instances are not wanting (though they seem soon forgotten by the men) of large firms being driven away from this district to others more favourably circumstanced; other firms may have to follow before it is too late. It has been frequently forced on our attention in the course of our efforts to get trade that Manchester is already heavily handicapped and we are convinced that she cannot find continuous employment for her men against any further adverse conditions. It is that firm conviction which found expression in our phrase, 'that in the best interests of both capital and labour a general rise in wages at the present time is not justified, and would be inexpedient.' We earnestly commend these views to your consideration and trust that you may hesitate to take any steps that would entirely neutralize for both interests the present activity of trade, and that may ultimately prove ruinous to one of the staple trades of this district. If you desire an interview and will communicate with the secretary of the Employers' Association, a meeting between representatives of the employers and those of the several trades concerned can be arranged."

The wages question has undergone a further development by notices from the moulders throughout the Manchester district for an advance of 2s. per week. These notices expire on October 6th, and the men intimate that unless the advance is conceded they will forthwith go out on strike. The present rate of wages received by the moulders is 38s. per week, and about 1,200 men are affected by the notices. Already advances have been conceded to the moulders in many Lancashire districts, which were previously low paid, and there is evidently a determination on the part of the Manchester moulders to enforce an advance in their district. As, however, a large portion of the engineering trades employers are involved in this question of the moulders' advance, it will no doubt be dealt with in conjunction with the application sent in by the engineering trade operatives for an advance, and a further meeting of the Iron Trades Employers' Association will probably be called to consider the whole question.

The usual monthly returns of the engineering trades unions are again satisfactory, the unemployed list continuing remarkably low. The Amalgamated Society of Engineers has not more than two and a third per cent. of the total membership on support, whilst in this immediate district the number on benefit had been reduced to about one per cent. of the local membership. The Steam Engine Makers' Society reports about three-quarter per cent. on donation. The returns received from different districts as to the state of trade, continue of a very favourable character, activity being reported in practically all departments, marine centres being generally in a very satisfactory position, and the only districts where any considerable number of members are out of employment, are where local wages disputes are in progress.

Messrs. Laird Bros., of Birkenhead, continue very busy on orders in hand, and are making rapid progress with the four vessels they are building for the City of Dublin Steam Packet Co., for the accelerated mail service between Holyhead and Kingston, under the conditions of the new Mail contract. The second of these, the *Leinster*, has been launched during the past month, the third will be launched during October, and the last in the course of the next few months. The *Leinster* is an exact duplicate of the *Ulster*, which was launched last June, and of which a description was published in the Marine Engineer at the time.

Messrs. Fletcher, Russell & Co., Limited, of Warrington, are introducing an improved gas muffle furnace, which is specially adapted for hardening steel dies, twist drills, &c., silver and gold assays, enamelling on metals, &c. These furnaces are very strongly made, so as to be suitable for hard use in ordinary workshops, and give absolutely reliable results at the lowest ordinary day pressure of gas. They are made in stock sizes, with muffles eight, ten and twelve inches wide, and fourteen inches long in working space. The temperature is absolutely uniform from end to end, and can be graduated and adjusted to any extent, so that the irregularity in hardening costly steel cutters, caused by variations in temperature, is altogether obviated. We may add that the firm make special gas-heated furnaces for experimental and precise work of every kind, including forges, rivet furnaces, brazing blow-pipes for coal, or Dowson gas, up to any required power, reverberatory furnaces, and coal-testing retorts.

A number of improved designs in self-acting hydraulic pumps are being brought out by Mr. John Blake, Accrington. These pumps are constructed to work night and day, and will raise water from a stream falling a few feet, to almost any height and distance. Gun-metal is liberally used in the construction of the rams, which require no oil or packing, and are throughout fitted up in a most substantial and workmanlike manner. One special design is a ram to work with a good fall and short lift, and to force up one-third of the water which drives it; and another pattern is made for pumping clean water from a well or spring, while the motive power is obtained from a stream of impure water. The Blake pumps are specially suitable for raising water for feeding boilers, and small turbine water-wheels, as well as for town's supplies, and have been adopted at a large number of private and public establishments.

Messrs. Lancaster & Tonge, Manchester, makers of the well-known "Lancaster" marine steam traps, have just completed considerable alterations and extensions of their works at Pendleton, and have put down new machinery and plant, which places them in a position to execute their orders much more expeditiously. We understand that the extensions were rendered absolutely necessary by the rapid growth of the firm's business.

A new firm, under the style of W. J. Jenkins & Co., at the head of which is Mr. W. J. Jenkins, late manager of Messrs. West's Gas Improvement Co., Manchester, have recently taken over and restarted the Beehive Works, Retford, Notts. The works will be carried on in three departments, including foundry, mechanical, and constructional departments. In the foundry, engineers' castings and chilled iron rolls for flour-milling, seed-crushing, and metallurgical purposes will be made. In the mechanical branch, roller flour mills, &c., will be constructed, with the further speciality of Mr. Jenkins' improved patent air-compressors. The mechanical details of elevators and conveyors, lifts, capstans, gas exhausters, breaking and sorting machinery, and steam engines for gas works, will also be constructed in this department; whilst in the constructional department will be manufactured the wrought-iron and steel work of roofs, elevators, conveyors, purifiers, and other constructional requirements for gasworks.

In the iron trade the position has shown a decided improvement during the past month, a satisfactory weight of business having been put through, with an upward tendency in prices. Pig-iron is in fair demand, and, although there is still underselling by merchants, makers hold strongly to their full quotations, and in most brands are asking a substantial advance on late rates. Local brands remain firm at 46s. 6d., less 2½ for foundry delivered Manchester, and 44s. for forge, delivered Warrington. In district brands Lincolnshire has been advanced 1s. per ton, prices now being 42s. for forge and 43s. for foundry, net, delivered Manchester, and 42s. 8d. for forge, delivered Warrington, and the lower-priced Derbyshire foundry qualities are also quoted 1s. higher, 46s. to 47s. net cash, delivered Manchester, being now the average figures. As regards outside brands, there has been an upward move of 9d. to 1s. per ton, and makers of Middlesbrough now quote 47s. 1d. net cash, with G.M.B.'s scarcely obtainable through merchants under 46s. 7d. to 46s. 10d., delivered by rail Manchester; whilst in Scotch iron, Eglinton and Glengarnock are quoted 46s. 6d., delivered Fleetwood, Morecambe, or Garston, and 48s. 6d. delivered Ship Canal, Manchester.

With regard to the competition of American pig-iron, although very little headway is being made in this district, and scarcely any business of moment has been done in foundry brands, moderate purchases of forge qualities have been made by one or two of the large finished iron works in the Warrington and Wigan district, and the price at which the iron has been bought brings it considerably under local and district brands, forge numbers being delivered Warrington at about 40s. to 41s. net cash, and the quality is reported as satisfactory. The permanent establishment of a trade in American pig-iron in this district is, however, still regarded as extremely doubtful.

Finished iron maintains a strong position, makers being all well employed, with prices showing a hardening tendency. For Lancashire bars, the minimum quotation on inland sales remains at about £5 10s., with makers' price at £5 12s. 6d. f.o.b. Liverpool; whilst North Staffordshire bars average £5 12s. 6d. to £5 15s., delivered in this district. Sheets are steady at £7 5s. to £7 10s., and hoops, £6 2s. 6d. for random, to £6 7s. 6d. for special cut lengths, delivered in Manchester district, and 2s. 6d. less for shipment.

An active business is reported in the steel trade, but there is no improvement in prices, which, in some directions, are scarcely maintained at late rates. Hematites are readily obtainable at 57s. to 57s. 6d. less 2½, and local billets could now be bought at £4 6s. 3d. net cash, delivered Manchester, prices having been forced down by the competition of American billets, which have been sold at about £4 per ton, delivered Warrington; bars do not average more than £6, and boiler plates £6 2s. 6d. to £6 5s. delivered in this district.

The metal market continues brisk, a good deal of work for marine requirements having been secured, and, except a reduction of ¼d. per lb. on copper wire, prices are firm at full list rates, the minimum quotations, delivered Manchester district, being as follows:—Solid drawn brass boiler tubes, 7d.; brass surface condenser tubes, 8½d.; copper tubes, 8½d.; brazed copper gas and steam tubes, 8¼d.; brazed brass gas tube, 7½d.; brazed brass machine tube, 7¼d.; brass wire, 6¼d.; copper wire, 7¼d.; and rolled brass, 6d. per lb.

In the timber trade the position is, on the whole, satisfactory, prices generally being well maintained, with here and there a slight advance. Stocks are not excessive, and prospects generally are fair for a steady market. Teak logs and planks have moved away steadily, and prices are firm, with stocks moderate. Only one cargo of greenheart has arrived; stocks are light and values well maintained.

The coal trade shows no appreciable improvement, the demand generally continuing slow, with pits on short time, and prices at the lowest summer rates. House coals meet with rather more enquiry, but best Wigan Arley is still obtainable at 9s. 6d. to 10s.; Pemberton four-ft. and seconds Arley 8s. to 8s. 6d.; and common house-coal 6s. 6d. to 7s. per ton at the pit mouth. Steam and forge coals are in fair request, but with local supplies more than sufficient to meet the demand, and surplus lots offering from other districts, prices are kept down at at a very low level, 5s. 6d. to 6s. being the full average for ordinary descriptions, at the pit-mouth. Engine fuel, now that the holiday stoppages in the Lancashire manufacturing centres are over, moves off pretty readily, but low-priced supplies are coming in from the Midlands, with the result that buyers expect that some reduction will be made in prices for Lancashire slack. Local colliery owners, however, show no signs of giving way, and their quotations remain at about 3s. to 3s. 6d. for common, and 4s. 3d. to 4s. 9d. for better sorts, at the pit-mouth.

Business for shipment continues slack, and only practicable at unremunerative prices, with ordinary steam coal obtainable at 6s. 9d. to 7s. per ton, delivered Mersey ports, or Manchester Ship Canal.

BELFAST TRADE NOTES.

(*From our own Correspondent.*)

THE threatened lock-out of the engineers here has been averted at the last moment by the men on strike on the Clyde resuming work. The Belfast masters withdrew the lock-out notices posted on the gates on Thursday, the 10th inst., just two days before the time expired for their taking effect. Much relief was felt by all classes at the avoidance of a repetition of the disastrous conflict barely a year ago.

The most important event of the month has been the launching of the twin-screw steamer *Pennsylvania* by Messrs. Harland & Wolff. This immense steamer, which has been built to the order of the Hamburg-American Steam Packet Co., enjoys the proud distinction of being the largest afloat, or, as a local paper put it, in true Irish fashion, the biggest vessel on "EARTH."

Her principal dimensions are as follows, viz.:—Length, deck measurement, 585 ft.; beam, 62 ft.; depth from keel to awning deck, 42 ft., with a displacement little short of 30,000 tons. The engines are twin-screw, quadruple expansion (Schlick's patent), developing 6,000 I.H.P., and calculated to give an average speed of 14 knots per hour. The working pressure of the boilers is 210 lbs. per square inch. The vessel is intended for trading between Hamburg and New York, and has accommodation for 200 first-class, 150 second-class, and 1,000 steerage passengers. The great dimensions of this vessel have enabled the builders to increase the size of the dining, state and other rooms, as well as the quarters for the ships' officers and men, while every modern convenience will be provided for their comfort.

For the rapid handling of cargo no less than 17 winches will be provided, while the vessel also carries four steam cranes on deck. These appliances command the nine hatchways with which the vessel is fitted. Reverting to the engines, a fact worthy of notice is the great length of the propeller shafting, viz., 230 ft., which, we believe, is the longest known. The engines have been built with a special view of avoiding vibration as much as possible, and her builders are said to have such confidence in the special arrangement of cranks, which is the feature of the patent already mentioned, that they are building several other sets of engines on the same principle.

Messrs. Harland & Wolff have two other vessels for the same company in hand at present. Those are 6,000-ton steamers, intended to run to Baltimore. Besides this the keel of a sister vessel to the *Pennsylvania* is being laid down in Hamburg.

Messrs. Harland & Wolff also launched during the month the twin-screw steamer *Gascon* for the Union Steamship Co.'s service to and from South Africa. The *Gascon* is the first of three new boats, similar in design to, but slightly larger than, the four G's, *Greek*, *Goth*, *Gaul*, *Guelph*, already running in the Union Line and which have proved so successful. The new vessels are over 6,000 tons gross, and will be propelled by twin-screw triple-expansion engines. Accommodation of the most complete character is provided on board for first second and third class passengers. Her fittings include electric light, refrigerator, and cold chamber for the storage of fruit.

Messrs. Workman, Clark & Co. also put another vessel into the water from their south yard, named the *Magician*. This steamer has been built to the order of Messrs. T. and J. Harrison, Liverpool, and is entirely similar in dimensions and appearance to the s.s. *Logician* and *Senator*, built for the same line some little time ago.

The s.s. *Denton Grange*, the latest addition to the fleet of Messrs. Houlder Brothers, London, ran a successful trial trip in the Lough, and proceeded to Newport (Mon.) to take up her place in their regular sailings between London, Cardiff, Newport, South America, Australia and the Cape. Her dimensions are.—Length, 420 ft.; breadth, 54 ft.; depth, 32 ft.; gross tonnage, 5,850, with a deadweight capacity of about 8,500 tons. The principal feature of her construction consists in dispensing with large hold beams, their place being taken by continuous side stringers. This allows a much larger stowage capacity, a great consideration in the carrying of frozen meat. The boilers, three in number, are fitted with Howden's forced draught. On the mile the engines developed about 3,200 I.H.P., giving an average speed of about 13½ knots.

Messrs. Harland & Wolff have now practically completed the Dominion liner *Canada*, and it is expected she will leave towards the end of the month. The same remark applies to the t.s.s. *Comic* for the Belfast Steam Shipping Co. These two steamers present a fine comparison as they lie at present in the Abercorn Basin, the *Canada*, of nearly 9,000 tons, completely dwarfing the *Comic* of about 875 tons.

The t.s.s. *China*, for the P. & O. Co., still lies at the crane, her machinery being in a somewhat backward condition as compared with the hull and fittings.

Messrs. Harland & Wolff have already replaced a large part of the sheds destroyed by the recent fire, and the work of rebuilding has also proceeded briskly in Messrs. Workman, Clark & Co.'s establishment. The extension to the engine shop of the Queen's Island are also nearly finished, and the firm are now contemplating extensions to smithy and boiler shops.

Inquiries for steamers are numerous, it is said, at present, and business continues brisk in all departments.

At the Columbia Ironworks, Baltimore, a submarine torpedo boat is in process of construction. It is calculated that the boat will be able to maintain a speed of eight or nine knots per hour when submerged to a depth of 60 feet.

NORTH-WEST OF ENGLAND.

(From our own Correspondent.)

Barrow.—Nothing that is new can be noted in the position of the shipbuilding industry of the North-West of England. There is a fair, but not active demand for new commercial tonnage, and the Barrow Co. has tendered for some important orders of this class, with anticipations of securing some of the work; but prices still run low, and it is difficult to secure contracts in competition with the East Coast, as the cost of construction is greater on the West Coast by reason of the higher class of work generally undertaken here, and the employment of men who are not used to doing cheap work. When a yard like that at Barrow adapts itself for the best commercial work, such as high-class Atlantic liners, and the construction of the best description of Admiralty work, it is difficult to undertake a lower class of work, and produce it at a price to compete with those who are accustomed to it, and make it the feature of their trade. The Barrow Co., along with eleven other private firms, has tendered for one of the three first-class cruisers of the *Niobe* class, and the result of the competition is expected to be known in the course of a few days. Low quotations are naturally expected, seeing that so many firms are tendering for the work. Several of the firms have not attempted this class of work before. Other Admiralty work has yet to be given out, but the pick out of this year's programme is naturally the first-class cruisers. They are similar in type to the three already building at Barrow, Fairfield, and Clydebank. Next month the *Avon*, a torpedo-boat destroyer, will be launched at the Barrow yard. She is one of the four 30-knotters building at Barrow. The *Bittern*, a sister ship, is also ready for launching, and will probably leave her ways in November. The two others, the *Otter* and the *Leopard*, will not be launched till next year, but the first-class cruiser *Niobe* will be included in the tonnage floated from the Barrow yard this year. The *Clan Sutherland*, built for the Clan Line, has been launched this month, and will probably be ready for sea by the end of October. The *Clan Sinclair*, which is to be tripled or otherwise modernized, is expected at Barrow every day, and it is whispered that Messrs. Cayzer, Irvine & Co. have other tripling jobs to give out in the course of a short time. Much progress is being made with the three twin-screw channel steamers building at Barrow, one for the Barrow and Belfast service, and two for the Great Western Channel service. The first named, the *Duchess of Devonshire*, will be launched early in next year, if not before Christmas, as she is to be on her station early in next year's season. The dispute with the blacksmiths as to the employment by the Naval Construction and Armaments Co. of a non-society man was settled by this man's discharge, although the management did not concede the principle that they were not in a position to employ a non-society hand. Certain work on the *Powerful* and other ships had to be completed, and the company could not delay this to fight out the case with the men. A novel and important County Court case arose on the subject. The non-society man sued the Blacksmiths' Society for the action they took in securing his discharge, and he not only won his case, but a verdict of £21 against the Society was obtained. His Honour Judge Steavenson made some strong remarks on the case, and hoped that on appeal it would be taken to a higher court, as the action of the men struck at the very root of freedom of employment. A shorthand note of the proceedings was obtained by the Society, but it is stated no action has as yet been taken in the way of an appeal to the higher courts. It will be noticed this is a similar case to that which caused the recent strike on the Clyde at Govan. On the engineering side of the Barrow works much satisfaction is felt at the settlement of the Govan dispute before it developed into what promised to be nothing short of a great industrial war. The masters had given notice that 25 per cent. of the engineers employed would be suspended pending the settlement of this strike, and the men had determined that if 25 per cent. were suspended, the rest would leave work *en bloc*. The *contretemps* was fortunately avoided, and it is well that this was so, for the engineers at Barrow are very busy and likely to remain so on the work they have in hand. Thornycroft water-tube boilers are being built for the four torpedo-boat destroyers, and Belleville boilers are being built for the *Niobe*. There is not much work in boilers of the ordinary type in the boiler shop, indeed the increased use of the water-tube boiler in Admiralty vessels is having the effect of crippling, to a great extent, the boiler-making trade, as most of the work of building the new class of boiler falls to the lot of the engineer, and as a consequence, there is more or less of a feud between the two trades. This at one time led to a brief strike at the Barrow yard. The boiler-makers are not yet satisfied with the decision arrived at on this question, and in all probability it will arise again when the boiler-makers feel they have a case to go upon. There is not much repair work going on at present, nor are prospects good in this department. The old *Princess of Wales*, paddle-boat of the Fleetwood and Belfast service, is being broken up at Barrow. The London and North Western and Lancashire and Yorkshire Railway Co.'s intend ordering another fast Channel steamer to steam 20 knots, and as the fastest steamer in their service, the *Duke of Lancaster*, was built at Barrow, and has not only proved in every sense highly satisfactory, but at the same time the fastest Channel steamer afloat, it is hoped and expected that the order for an even faster ship will be secured at Barrow. The Barrow Co. has made for itself a reputation in Channel steamer construction in recent years. The *Blackrock*, running between Liverpool and Dublin, is the fastest boat on that station, and the *Lady Wolseley*, running from Dublin to London, is also the fastest boat engaged in trading between these ports. The three Channel steamers referred to above, now building at Barrow, are all fast-speeded and first-class examples of shipbuilding, and it is whispered that the next steamer built for the Fleetwood and Belfast line is to outstep not only these boats now in course of construction, but also the fast steamers on the Liverpool and Belfast service.

West Cumberland.—There is marked activity in the shipbuilding trade of West Cumberland, and the yards in that district are still busy on the building of small craft, which is their special line of work. As orders are completed, other work comes to hand, and there is a regularity of employment which does not seem to vary even with the fluctuations of the shipbuilding trade in general.

Shipbuilding Materials.—There is a more active demand for all classes of shipbuilding material, and orders are coming to hand from local and outside sources very freely. Plates are especially in brisk request, both heavy and light. The heavy plate mill at Barrow, which is one of the best in the country, broke down last month, but has since been repaired, and is now in active work again, makers holding plenty of orders not only on local but on general account. Present prospects indicate that work will be briskly maintained at these mills throughout the winter and the spring of next year. Heavy steel castings for shipbuilding purposes especially enjoy a brisk market, and overtime is being generally worked.

The Hematite Trade.—The hematite market is much stronger than it has been, and there is a good demand for Bessemer all round, as steel-makers, locally and otherwise, are using very large parcels and require a continued and regular supply. The value of Bessemer iron is firm at old rates, 48s. to 49s. 6d. net f.o.b. for mixed Bessemer Nos. Forge and foundry iron is not quoted, as very little business is doing in this department. Warrant iron is steadier at 47s. 2½d., sellers net cash, 47s. 2d. buyers. One encouraging feature this month is that stocks of warrant iron have been reduced fully 5,000 tons. They still represent over 300,000 tons, and show an increase on the year of about 17,000 tons. Only 36 furnaces are in blast as compared with 30 in the corresponding period of last year, but it is probable additional furnaces will soon be lighted as the consumption is greater than the output.

Shipping.—The shipping trade has fluctuated somewhat during the month, but an improvement, generally speaking, is the net result, and at present much activity is shown in the exports of pig-iron and steel from West Coast ports. During the year, so far as it has proceeded, the exports of pig-iron from West Coast ports has reached 229,867 tons, and of steel 352,051 tons, as compared with 213,360 tons of pig-iron, and 274,139 tons of steel in the corresponding period of last year, an increase of 16,507 tons of pig-iron and 77,912 tons of steel.

The September issue of the *Canadian Engineer* is of special interest to all users of steam power. It contains a full report of the Seventh Annual Convention of the Canadian Association of Stationary Engineers, profusely illustrated by pen-and-ink sketches made on the spot by the *Engineer* artist, and also a number of special articles bearing on the economical development of power.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Novorossisk.—On August 8th a steel steam schooner, of about 1,328 tons, was launched at Sunderland; owned by the Azoff Steam Navigation Co., Odessa.

Olwen.—On August 11th the *Olwen*, a wooden sailing schooner, was launched at Pembroke Dock, owned by W. Francis, of Milford.

Turquoise.—On August 12th an iron steam ketch, of about 150 tons, was launched at Hull; owned by the Kingston Steam Tel. Co., Limited, Hull.

Agatha.—On August 12th an iron steam ketch, of about 150 tons, was launched at Beverley; owned by Mr. William Grant, Grimsby.

Belgica.—On August 13th an iron steam ketch, of about 150 tons, was launched at Beverley; owned by Messrs. Hessens, Halswyck & Co., Ostend.

Devonian.—On August 24th a steel and iron steam ketch, of about 132 tons gross, named the *Devonian*, was launched at North Shields; owned by the Co-operative Box and Fish Carrying Co., Grimsby.

Wingrove.—On August 24th Messrs. Short Brothers successfully launched from their works at Pallion a handsomely-modelled steel screw steamer, built to the order of the Wingrove Steam Shipping Co., Limited, of London. The vessel is built of Siemens-Martin steel, to the highest class in Lloyd's Registry, under special survey, and it is constructed on the improved spar deck principle, with single deck laid, having open beams on main deck, on which a deck can be laid at any time to suit the trade in which she may be engaged. The holds are four in number, with six powerful steam winches, and very large donkey boiler. Steam steering gear is fitted at the after end of engine platform, with controlling rods from flying bridge. The bottom is of cellular construction, divided into six compartments for water-ballast, the after peak being also fitted up as a trimming tank. Every attention has been given in the arrangements of the vessel for the quick loading and discharging of cargoes, and the appliances are of the latest pattern. The vessel is fitted with triple-expansion engines by John Dickinson & Sons, Limited, of Sunderland, having cylinders 23 in., 38 in. and 62 in. diameter, with a stroke of 42 in., steam being supplied by two large steel boilers working at 160 lbs. pressure. Howden's system of forced draught is also fitted with all the latest improvements in marine engineering. During construction the vessel and engines have been under the supervision of Mr. Parker, of London. On leaving the ways the vessel was named *Wingrove* by Miss Richardson, of Wingrove House, Newcastle.

Three-masted Schooner.—On August 24th there was launched from the shipbuilding yard of Mr. W. H. Lean, Falmouth, a finely-modelled steel three-masted schooner, built to class 100 A1 at Lloyd's, under their special survey, and with all the latest improvements. The principal dimensions are:—Length, 102 ft. b.p.; breadth, 23 ft.; draught when loaded, 11 ft.; gross register, 165 tons; and about 320 tons deadweight. She is not yet named, as she is for sale, and launched to make room for laying down another steel schooner of smaller dimensions.

Tadorna.—On August 25th Messrs. Wigham Richardson & Co. launched from their Neptune Shipyard, Newcastle-on-Tyne, a steel screw steamer, which they have constructed to the order of the Cork Steamship Co., Limited, of Cork, for their Continental service. The vessel is 255 ft. in length by 33½ ft. beam; she will be rigged as a two-masted schooner, and will have comfortable accommodation for a limited number of passengers. The engines and boilers are also being constructed by Messrs. Wigham Richardson & Co., and the whole work is proceeding under the superintendence of Mr. F. C. Kelson, of Liverpool, the superintending engineer of the company, and of Captain Hore, of Liverpool, both being present at the launch. As the steamer left the ways she was named the *Tadorna* by Mr. Richardson's niece, Miss Teresa Merz, of the Quarries, Newcastle.

Alton.—On August 25th was launched the new steamer *Alton* from the Whitehall Shipbuilding Yard, Whitby, this being the largest vessel yet built at Whitby. The dimensions are as follows:—Length, over all, 345 ft. 2 in.; breadth, 42 ft. 6 in.; depth, 26 ft. 7½ in. Her estimated deadweight carrying capacity is 5,150 tons, and her direct-acting triple-expansion engines by Blair & Co., of Stockton, are of 220 H.P. nominal. Class 100 A1 at Lloyd's, under special survey of hull and machinery. She has six watertight bulkheads of steel, five steam winches, and steam steering gear.

Condor.—On August 25th there was launched from the shipbuilding yard of Messrs. J. T. Eltringham & Co., South Shields, a steel screw tug of the following dimensions:—Length, b.p., 86 ft. 6 in.; beam, moulded, 19 ft.; depth, moulded, 11 ft. She is to be fitted with compound engines by Messrs. Hepple & Co., South Shields. The vessel, which was named the *Condor*, is expected to attain a speed of 12 knots, and has been built to the order of the Gamecock Towing Co., Gravesend.

Lockwood.—On August 25th a steel steam schooner of about 1,143 tons gross, named the *Lockwood*, was launched at Sunderland; owned by Mr. H. C. Pelly, London.

Barrozo.—On August 25th Sir W. G. Armstrong & Co., Limited, launched from the Elswick shipyard, Newcastle-on-Tyne, the *Barroza*, a cruiser built to the order of the Brazilian Government. She is built of steel, her under-water portions being sheathed with wood and copper. Her principal dimensions are:—Length, 330 ft.; breadth, 43 ft. 9 in.; draught, 16 ft. 10 in.; and displacement, 3,450 tons. She is protected throughout the whole of her length by a curved steel armour deck. This deck completely covers all the machinery, magazines, and steering gear, and additional protection is afforded by the reserve coal bunkers, which are carried along the vessel's side to a height of about 6 ft. above the water-line. The *Barrozo* will be provided with guns of Elswick pattern, the armament comprising six 6-in. quick-firers of 50 calibres in length, four 4·7-in. quick-firers of 50 calibres, 10 6-pounder and four 1-pounder Nordenfelts, four Maxim guns, and two field guns. She will also have three torpedo tubes. The six 6-in. guns are arranged to fire three ahead and three astern. With full bunkers the vessel will be able to traverse a distance of about 8,000 knots at a moderate speed. The vessel is fitted with twin screws, and machinery of 7,500 I.H.P., and is expected to attain a speed of 20 knots.

Jacinth.—On August 27th an iron steam ketch of about 150 tons, named the *Jacinth*, was launched at Hull. Owned by the Kingston Steam Trawling Co., Limited, of Hull.

Harborne.—On August 27th Messrs. S. P. Austin & Son, launched at Sunderland the steel screw steamer *Harborne*, built to the order of Messrs. J. & C. Harrison, London. Her dimensions are as follows:—Length, 235 ft.; breadth, 34 ft.; depth, 17 ft. 4 in. The vessel has been constructed under special survey at Lloyd's to class 100 A1. Her machinery will be supplied by Messrs. John Dickinson & Sons, Limited, and will be of the tri-compound type to indicate 650 H.P.

Lapwing.—On August 29th a steel steam schooner of about 124 tons gross, named the *Lapwing*, was launched at Sunderland, owned by the Caithness Steam Fishing Co.

Savan.—On September 5th there was launched from the shipbuilding yard of Messrs. John Readhead & Sons, West Docks, South Shields, a steel screw steamer, built to the order of Messrs. Scrutton, Sons & Co., London. The vessel is of the following dimensions:—Length, 312 ft.; breadth, 41 ft.; and depth, moulded, 25 ft. 7 in., and she is classed 100 A1 at Lloyd's, under special survey. The engines, also constructed by Messrs. John Readhead & Sons, are of the triple-expansion type, having cylinders 25 in., 40 in. and 65 in., by 42 in. stroke, supplied with steam from one large steel boiler, working at a pressure of 160 lbs. per square inch. She is intended for the West Indian trades. As the vessel left the ways she was named the *Savan* by Miss McLaren, of London.

Bengal.—On September 7th an iron steam ketch of about 150 tons, named the *Bengal*, was launched at Hull. Owned by the Hull Steam Fishing and Ice Co., Limited.

Huron.—On September 7th Messrs. Joseph L. Thompson & Sons, Limited, of the North Sands Shipbuilding Yard, Sunderland, launched the *Huron*, built to the order of the Mercantile Steamship Co., Limited, London, this being the eighth vessel built by Messrs. Thompson to the order of this company. Her principal dimensions are:—Length between perpendiculars, 325 ft.; breadth, extreme, 44 ft. 6 in.; depth, moulded, 22 ft. 2 in. The vessel is built to the partial awning deck rules, and is designed to have a carrying capacity of about 4,600 tons with Lloyd's summer free-board. She has six watertight bulkheads and an iron longitudinal bulkhead fore and aft, to the height of the weatherdeck. She is rigged as a two-masted fore and aft schooner, and has a complete system of derricks for the handling of cargoes. The whole of the officers', engineers', spare berths, and saloon accommodation is fitted amidships, the saloon house being a continuation of the engine and boiler casing. Above this is placed a large chart and wheel-house, and the pilot bridge overhead. A flying bridge is also fitted forward of the foremast. The engines and boilers will be fitted by Messrs. Thomas Richardson & Sons, Limited, of Hartlepool, having cylinders 23 in., 38 in., and 64 in. by 42 in. stroke, with two large multitubular boilers, working at 160 lbs. pressure. The vessel was launched by hydraulic power, and gracefully christened by Miss Gladys Buchanan, daughter of Captain Buchanan, secretary of the company. There were also present Captain, Mrs., and Miss Buchanan, London; Mr. J. H. and Mrs. Cox, Dr. Burdon Cox, Rev. J. H. Harwood, London; Mr. James and the Misses Speeding, Mr. John and Miss Dickinson, Madame Léchere, Antwerp; Miss Darling, Mr. and Mrs. Robert Thompson, Mr. and Mrs. C. E. Thompson, Mr. James Marr, Mr. P. Phorson, &c. The launch was most successful in every way.

Vulcan.—On Monday, September 7th, Furness, Withy & Co., Limited, launched from their yard at Hartlepool a large steel screw steamer, built to the order of John Lockie, Esq., Newcastle-on-Tyne. She is a fine type of a modern cargo boat, measuring over 350 ft. in length, and built throughout of Siemens-Martin steel, with a large measurement and deadweight capacity, and built to the highest class at British Corporation. The vessel is of the single-deck type, with poop, bridge, and a topgallant forecastle. The holds are fitted with iron grain divisions, and all deck erections, skylights, bulwarks, bulkheads, &c., are constructed of steel and iron. Cellular bottom fitted all fore and aft for water ballast. The greater portion of the plates are in 24 ft. lengths, making the structure of the ship very strong. Five steam winches, patent steam steering gear amidships, screw gear aft, direct steam patent windlass, stockless anchors, hauling into hawse pipes, and other modern appliances are fitted for the handy working of the vessel. The saloon and cabin, providing accommodation for the captain, etc., is handsomely furnished in polished hardwood. The steamer will be rigged as a two-masted fore-and-aft schooner, and has been constructed under the supervision of Mr. W. Stevenson, of Newcastle-on-Tyne. She will be fitted with triple-expansion engines of massive design, with every provision for economical working, by Sir Christopher Furness, Westgarth &Co., Limited, Middlesbro'. On leaving the ways she was gracefully christened *Vulcan* by Miss Lockie, Jesmond, Newcastle-on-Tyne.

Steel Screw Steamer.—On September 8th Messrs. W. Dobson & Co. launched at Low Walker-on-Tyne, a large steel screw steamer of the following dimensions:—Length, 362 ft.; breadth, 44 ft.; depth, moulded, 29 ft. The vessel is built to take Lloyd's highest class as a spar-deck steamer. The propelling machinery consists of a set of triple-expansion engines, having cylinders 24 in., 40 in., and 64 in. diameter, and 45 in. stroke, steam being supplied by two large single-ended boilers. The engines and boilers have been constructed by the North-Eastern Marine Engineering Co., Limited, of Wallsend.

Collingwood.—On Tuesday afternoon, September 8th, Messrs. Richardson, Duck & Co. launched from their yard a steel screw steamer of the following dimensions:—Length, over all, 319 ft. 6 in.; beam, extreme, 44 ft.; depth, moulded, 22 ft. 10½ in.; gross tonnage, 2,420 tons; deadweight, 4,100 tons, on 18 ft. 11 in. This vessel, which has been built to the order of the Steamship "Camperdown" Co., Limited, London, per Mr. Edwin Nye, managing director, will class 100 A1 in Lloyd's register, and has been built under special survey. She is of the single deck type. A double bottom throughout and after peak tank are fitted for water ballast, and the equipment includes four steam winches, large horizontal donkey boiler, steam windlass, steam steering gear, stockless anchors, &c. The engines are by Messrs. Blair & Co., cylinders, 22½ in., 37 in., and 61 in., by 42 in. stroke, steam being supplied by two single-ended boilers working at 160 lbs. pressure. As the vessel was leaving the ways she was christened the *Collingwood* by Miss Nye, of Naworth, Shortlands, Kent.

Turret Chief.—On September 8th the s.s. *Turret Chief* was launched from the yard of Messrs. William Doxford & Sons, Limited, of Sunderland, having been built to the order of Messrs. Petersen, Tate & Co., Newcastle.

Dunraver.—On September 9th Messrs. Ropner & Son launched at Stockton-on-Tees a steel screw steamer of the following dimensions, viz.:—Length, b.p., 325 ft.; breadth, extreme, 46 ft. 6 in.; and depth, moulded, 27 ft. The steamer has been built to the order of a Cardiff firm, and is built off the three-decked rule, with poop, bridge, and topgallant forecastle. She will be fitted with a set of triple-expansion engines by Messrs. Blair & Co., Limited. The christening ceremony was performed by Miss Radcliffe, daughter of the managing owner, who gave her the name of *Dunraven*.

Italy.—On September 9th there was launched by Messrs. Cochrane & Cooper, at Grovehill, Beverley, a new steam trawler. Her dimensions are:—95 ft. by 20 ft. by 11 ft. The vessel has been built to the order of the International Steam Trawling Co., of Grimsby, and will be fitted with 40-H.P. triple-expansion engines by Messrs. C. D. Holmes & Co., of Hull. She was named the *Italy*.

Jomsborg.—On Wednesday, September 9th, Messrs. William Gray & Co., Limited, launched a fine steel-screw steamer of the following dimensions, viz.:—Length, over all, 290 ft.; breadth, 39 ft.; depth, 21 ft. 4 in. She has been built to the order of Mr. C. K. Hansen, of Copenhagen, and will take Lloyd's highest class. The deck erections consist of short raised quarterdeck, bridge and topgallant forecastle. A handsome saloon, state-room, captain's room, &c., will be fitted up in a large deck-house on the bridge, and officers will also be accommodated in houses on top of bridge, also the engineers; and the crew forward. The sides of the vessel are built with deep frames, a cellular double bottom is fitted, and large ballast tank in the after peak. Five steam winches, large donkey boiler, steam steering gear placed in engine-room casing, hand screw steering gear aft, direct steam windlass, schooner rig, boats on beams overhead, iron grain divisions, and all improved appliances for working the steamer will be provided. The engines are of the triple-expansion type, working on three cranks, and are from the Central Marine Engine Works of Messrs. William Gray & Co., Limited, the cylinders being 20 in., 31½ in., and 53 in. diameter, with 36 in. piston stroke, and two large steel boilers to work at a pressure of 160 lbs. per square inch. The steamer has been superintended during construction by Mr. Hans Burmeister, on behalf of the owner, and the ceremony of naming her *Jomsborg* was gracefully performed by Lady Gray.

Ocean Barges.—On Friday, September 11th, Sir Raylton Dixon & Co. launched from the Cleveland Dockyards, Middlesbrough, three steel barges fitted for ocean towing. These vessels have a deadweight carrying capacity of 350 tons at 8 ft., and are fitted with water ballast and other appliances to make them thoroughly seaworthy. The same builders have also on the stocks an ocean barge of 1,000 tons deadweight. These vessels are all of very similar construction to those which they built for a Dutch company in the early part of the year, the working of which has proved highly satisfactory, and it is probable that this system of conveying coal to foreign parts will be very largely developed in the future.

Industry.—On September 11th was launched a lighter, built by Mr. Thompson, at the Bankside Shipyard, Hull, to the order of Mr. W. Taylor, of Hull. The vessel, which is built of English oak, with iron keelson, is 64 ft. long, 18 ft. 3 in. beam, 9 ft. depth of hold, and has a carrying capacity of 180 tons. She was christened by Mrs. Taylor, wife of the owner, who named her the *Industry*.

Leinster.—On September 12th the second of a fleet of four steamers—the *Leinster*—built by Messrs. Laird Brothers, for the City of Dublin Steam Packet Co., and intended to accelerate the mail service between England and Ireland, was launched at Birkenhead. She is an exact duplicate of the *Ulster*, launched from the same yard in June last, and the four boats—the *Ulster*, *Leinster*, *Connaught*, and *Munster*—are magnificent specimens of what the first-class British shipbuilding establishment can turn out; and if they are not easily 23-knot boats on their three hours' trial, something in the reasoning which works out fast boats is radically wrong. They are—Length, over all, 372 ft.; breadth, moulded, 41 ft. 6 in.; depth at side to upper deck, 29 ft. 3 in. heighth from main to upper deck, 8 ft. 8 in.; tonnage, builders' measurement, 3,069 tons; draught of water ready for service, 14 ft. 6 in.; speed, 23 knots. The material of the hull is steel, and there are ten watertight compartments. The long turtle-back forward is not a particularly graceful feature of the hull, but with that exception the boats are positively pretty, and their advent should begin an improvement round the coast. The subdivision is what one expected, and the internal arrangement is, taking the particular nature of the service into account, almost perfect. The machinery consists of two independent sets of inverted direct-acting tri-compound engines, each having one high, one intermediate, and two low-pressure cylinders. There are four double-ended boilers, each having six Morison's corrugated furnaces, and the working pressure is 175 lbs. per square inch. The closed stokehold system has been adopted. The name of the vessel was screened until after the christening ceremony, and when the Countess Cadogan released the ship and named her, there was cheering of the most enthusiastic description. There were naturally no checks, and the vessel had the free run of the Mersey, but she did not travel far Liverpool way, and before she had gone any distance with the flow was in charge of the tugs. There was a large and distinguished gathering on the occasion, including Earl Cadogan (Lord-Lieutenant of Ireland), Countess Cadogan, the Earl of Arran, the Earl of Limerick, Judges Boyd and Ross, Sir William Kaye, Colonel G. R. and Mrs. Dease, Sir Howard Grubb, Sir A. Rollit, M.P., Messrs. William and Edward Watson (managing directors of the City of Dublin Co.), Messrs. George Kinahan, John Murphy, and William Plunket Cairnes (directors of the same company), Captain Bell, R.N. (manager of the company at Liverpool), and Captain Kendall (the marine superintendent at Holyhead). After the launch Messrs. Lairds' guests lunched in a marquee erected on the deck of another vessel which is being constructed for the same service. The loyal toasts having been honoured, Mr. William Laird (who presided) proposed the health and happiness of the Lord-Lientenant of Ireland and the Countess Cadogan. Many of the visitors were afterwards shown over the extensive yard, and visited, among other vessels, the *Munster*, which will be launched in October, and the *Connaught*, which will be launched a few months later.

Trinidad.—On September 12th Messrs. Cook, Welton and Gemmell launched at Hull another steam trawler for the Hull Steam Fishing and Ice Co. The vessel is of the same class as the other steam fleeters owned by the company, being 98 ft. between the perpendiculars, 20 ft. 6 in. beam, and 11 ft. deep. Her engines, which have been built by Messrs. Amos & Smith, are triple-expansion, of 35 N.H.P. The vessel was christened *Trinidad*.

Unique.—On September 21st there was launched, by Messrs. John Priestman & Co., at Southwick, the first of a new type of vessel for which the builders have taken out a patent under the name of "a patent self-trimmer." She differs from other cargo steamers by having a raised central deck or superstructure connected with the vessel's sides by an intervening sloping deck. Another distinctive feature is a narrow platform at the side of the vessel and at the sides of the raised central deck. This arrangement is not adhered to throughout the whole length of the vessel, there being a departure from it at the fore and after ends, which parts of the ship are of the ordinary build. The advantages claimed for this type as compared with ordinary steamers are—reduced net tonnage, saving of trimming charges, good sea qualities on account of the more central disposition of cargo, and greater stability. The vessel has been specially strengthened above the water-line. In addition to the ordinary ballast tanks below bilges there is an optional, but under certain circumstances a doubtless important, arrangement to utilise a considerable quantity of water in the triangular space under the platform connecting the central with the sloping deck without reducing the carrying capacity. The vessel has been built to the order of Messrs. Rold, M'Nair & Co., of Glasgow. The dimensions are:—280 ft. long; 40 ft. broad; 20 ft. 3 in. deep, to carry about 3,300 tons on 18 ft. draught. The vessel will be engined by the North-Eastern Marine Engineering Co., with triple-expansion engines of 21 in., 35 in., and 58 in. cylinders, with 39 in. stroke, and will receive the highest Norwegian Veritas classification, and sail under the Norwegian flag. The ship was named the *Unique* by Mrs. Sigurd Rold.

Eversley.—On Tuesday, September 22nd, there was launched from the Southwick yard of Messrs. Robert Thompson & Sons a steel single-decked steamer, built to the order of Messrs. Henry Scholefield & Son, Newcastle-on-Tyne. Length between perpendiculars, 320 ft.; breadth, 46 ft.; depth, moulded, 23 ft. 9 in., on the deep frame principle, class 100 A1 at Lloyd's, deadweight capacity about 4,600 tons on a very light draught, and is fitted with poop aft, long bridge amidships on top of which are deck-houses for the accommodation of captain, officers and engineers, leaving a clear cargo space in bridge and poop, topgallant forecastle for crew and petty officers; ample water ballast in cellular bottom and after-peak, being divided into six compartments for trimming purposes, five large hatchways and steam winch to each hatch, extra large donkey boiler; engines by Messrs. Blair & Co., having cylinders 22½ in., 36½ in., and 60 in. by 39 in. stroke, with extra large boilers. Both ship and engines have been designed with all the most modern improvements for a first-class cargo and cattle steamer, and during her construction has been superintended by Mr. J. Baxter and Captain Temple. As the vessel left the ways she was gracefully christened *Eversley* by Miss Temperley, of Newcastle.

Turret Court.—On September 22nd there was launched from the yard of Messrs. W. Doxford & Sons, Limited, Pallion, the turret steamer *Turret Court*, which has been built to the order of Messrs. Peterson, Tate & Co., Newcastle-on-Tyne, and is the fourth sister vessel constructed from this model, having been specially designed to suit the locks on the Lachine Canal, Montreal. Her principal dimensions are:—Length, 253 ft.; breadth, 44 ft.; depth, 21 ft. 9 in. She has a deadweight capacity of 3,200 tons on 18 ft. of water. Her gross register is about 1,880 tons, net about 1,170 tons, and she is fitted with tri-compound engines 20 in., 34 in., and 57 in., with 39-in. stroke, and water-tube boilers of 200 lbs. working pressure, capable of driving the vessel 10½ knots per hour fully loaded. The *Turret Court* is No. 29 of the turret series, and the eighth vessel of this type built for Messrs. Peterson, Tate & Co. The christening ceremony was gracefully performed by Miss Phemie Cowan, of Aberdeen.

British Trader. — On September 24th there was launched from the Jarrow Yard of Messrs. Palmer's Shipbuilding and Iron Co.,Limited, a finely modelled steel screw steamer, built to the order of the British Shipowner's Co., Limited, Liverpool. Her dimensions are as follows:—Length, between perpendiculars, 350 ft.; beam, moulded, 45 ft.; depth 28 ft. 6 in. The vessel has been built under special survey to class 100 A in Lloyd's Register, and is of the three deck type, having a poop, bridge and forecastle. Two complete steel decks are laid extending all fore and aft. The poop is fitted for cargo,and the officers and engineers being berthed on the bridge in a large steel deckhouse, and the crew in the forecastle. Water ballast is provided for aft in a cellular bottom and in a deep hold tank amidships. All the necessary requirements to fit the vessel for general and grain cargoes are complied with, and all the most modern improvements for the safe handling of the vessel, and rapid loading and discharging of cargo are supplied and fitted throughout. The vessel is designed to load a deadweight of about 5,600 tons on 23 ft. As the vessel left the ways she was gracefully christened the *British Trader* by Mrs. Beazley, wife of J. H. Beazley, Esq. (of Messrs. Gracie, Beazley & Co.), one of the managing directors.

Goole No. 10.—Last month there was launched by Messrs. Reynoldson & Son, at Shields, a steam tug, built to the order of the Goole and Hull Towing Co., Limited. The boat is a powerful steel tug, 105 ft. long, and is to be engaged in the towing of oversea lighters between Goole and London. She was christened the *Goole No.* 10 by Mrs. W. H. Pilling, wife of one of the directors of the company.

LAUNCHES—Scotch.

Paqueta.—On August 24th there was launched from the yard of the Ardrossan Shipbuilding Co., Limited, a steel twin-screw yacht, built to the order of Mr. William Hutcheson, Almar, Rothesay. She measures 80 ft. long by 14 ft. broad by 8 ft. deep. Engines will be supplied by Messrs. Sisson & Co., Gloucester, of the following dimensions:—High pressure cylinder 7 in., low pressure cylinder 14 in. by 9 in. stroke, with a working pressure of 100 lbs. per square inch. She was named the *Paqueta*.

Joseph Fisher.—On August 25th there was launched by Messrs. John Fullerton & Co., Paisley, a steel screw steamer of 300 tons capacity, and which has been built to the order of the Newry and Kilkeel Steamship Co., Limited, Newry, for their own carrying trade, for which the steamer has been specially designed. Compound engines of 45 N.H.P. will be fitted by Messrs. Hall-Brown, Buttery & Co., Govan. The steamer was named the *Joseph Fisher*, by Miss Kennedy, of Glasgow.

Clan Ogilvy.—On August 26th Messrs. Alex. Stephen & Sons, Linthouse, launched a very fine steel screw steamer for the

Clan Line (Messrs. Cayzer, Irvine & Co., Glasgow). The vessel, which is one of about 2,700 tons, has been built under Lloyd's special survey for their highest class, 100 A1, three-deck rule, and the dimensions are 312 ft. by 40 ft. by 26 ft. 2 in.; the cylinders being 23 in., 38 in. and 63 in. by 42 in., with a working pressure of 200 lbs. She is a sister ship to the *Clan Chisholm*, and is the fourteenth built by Messrs. Stephen for the Clan Line. She was gracefully named *Clan Ogilvy* by Miss Emilie Rule Joss, daughter of Mr. John Joss, of Cayzer, Irvine & Co.

Chameleon.—On August 27th the *Chameleon*, a steel steam yawl of about 140 tons gross, was launched at Glasgow, owned by the Grimsby and North Sea Steam Trawling Co., Grimsby.

Crux.—On August 27th a steel steam yawl of about 140 tons gross, named the *Crux*, was launched at Glasgow, owned by the Grimsby and North Sea Steam Trawling Co., Grimsby.

Centaur.—On August 27th the *Centaur*, a steel steam yawl of about 140 tons gross, was launched at Glasgow, owned by Mr. W. F. Roberts.

Ardath.—On August 27th Messrs. William Hamilton & Co. launched from their Glen Yard, Port-Glasgow, a steel screw steamer of 2,900 tons gross tonnage and 1,800 tons net register tonnage, to carry 4,500 tons deadweight on a very light draught, for their own account. The vessel is intended for the Eastern and general trades. The following are the principal dimensions:—Length between perpendiculars, 310 ft.; breadth, 42 ft. 6 in.; depth, moulded to spar deck, 28 ft. The vessel has been built to the highest class at the British Corporation Registry, spar-deck type on the deep frame system, and is fitted throughout with a double cellular bottom for water ballast. The holds and 'tween decks are arranged so that shifting boards and feeders can be fitted for carrying grain in bulk. The vessel is schooner rigged, and the topmasts are made to telescope so that the vessel can pass under the bridges on the Manchester Canal. The accommodation for the officers and crew is of the most complete description, the captain and officers being placed in large house on spar-deck amidships, the engineers in houses alongside casing convenient to engine-room, while the crew is placed forward on the main deck. All the newest requirements for the quick loading and discharging and working of the ship have been supplied, including steam winches, steam windlass, and steam steering gear. The machinery, which is being supplied by Messrs. D. Rowan & Son, of Glasgow, is on the triple-expansion system. The cylinders are 22½ in., 37 in., and 61 in. diameter by 42 in. stroke, steam being supplied by two large boilers, 160 lbs. pressure. As the vessel left the ways she was gracefully named the *Ardath* by Mrs. Harvey, of Benclutha, Port-Glasgow.

Cidade de Manaos.—On September 3rd there was launched from the yard of Messrs. Murdoch & Murray, Port-Glasgow, a steel twin-screw passenger and cargo steamer, for service on the river Amazon, and is the second of four the firm have in hand for this trade. The dimensions are:—Length, 156 ft.; breadth, 33 ft.; depth, 17 ft. 6 in. The vessel has been built to the order of Messrs. E. A. de Costa & Co., and was named *Cidade de Manaos*. Triple-expansion engines will be supplied by Messrs. David Rowan & Son, Glasgow.

Hopper Barges.—On September 3rd there were launched from the yard of Lobnitz & Co., Limited, Renfrew, two hopper barges of 150 tons capacity each, built to the order of the British Admiralty for service at Portland. These, as well as six duplicate barges already completed by the builders, have been constructed under the supervision of Mr. David Hay, on behalf of the Admiralty.

Lourenco.—On September 7th Messrs. Carmichael, M'Lean & Co., shipbuilders, Main Street, Greenock, launched a finely-modelled and powerful screw-tug for the Delagoa Bay service of Sir Donald Currie's mail steamers. The dimensions of the vessel are as follows:—Length, 65 ft.; breadth, 13 ft.; and depth, moulded, 7 ft. 3 in. She will be supplied by Messrs. Kincaid & Co. with compound surface condensing engines, the diameter of cylinders being 10¼ in. and 21 in., with a piston stroke of 16 in. The boiler is 7 ft. 9 in. in diameter by 8 ft. in length, the working pressure being 110 lbs. This being the first launch of the new firm there was a large attendance of spectators. On leaving the ways the new tug was gracefully christened *Lourenco* by Mrs. George Scott, wife of Mr. Scott, naval architect to the Castle Line. After the launch the company, on the invitation of the builders, adjourned to the drawing office, where cake and wine were served, and appropriate toasts proposed.

Thornliebank.—On September 8th Messrs. Russell & Co. launched at Port-Glasgow the three-masted steel sailing ship *Thornliebank*, to the order of Messrs. Andrew Weir & Co., Glasgow, as an addition to their Bank line of sailing ships. The vessel registers 1,850 tons net, and will carry 3,300 tons deadweight, and was built under superintendence of Captain Auld; and Captain M'Bryde, for some years connected with the Bank line, will be in command.

Priscilla.—On September 9th there was launched from the yard of the Ailsa Shipbuilding Co. at Troon, a steel screw steamer of the following dimensions:—Length over all, 125 ft.; breadth, 22 ft. 6 in.; depth, moulded, 11 ft. 3 in.; built for the Zillah Shipping and Carrying Co., Limited, of Warrington, for the coasting trade. She is to be fitted with compound engines, having 16 in. and 33 in. cylinders, and 24 in. stroke, by Messrs. Muir & Houston. She was christened the *Priscilla* by Mrs. Savage, wife of Captain Savage, who is to command the steamer.

Rio Affua.—On September 9th Messrs. Russell & Co., Port-Glasgow, launched a steel screw steamer of 450 tons register, to the order of Messrs. E. A. Da Costa, Liverpool, for passenger and cargo service on the river Amazon. The steamer is named *Rio Affua*, and will be supplied with two sets of triple-expansion engines of 10 in., 16 in., and 26 in., by 21 in. stroke, by Messrs. Kincaid & Co., Greenock.

Tehuantepec.—On September 11th Messrs. Archd. M'Millan & Son, Limited, Dockyard, Dumbarton, launched a steel screw steamer, of dimensions 215 ft. by 30 ft. by 20 ft. 6 in., built to the order of Senor Don Domingo Abaunza, of Tobasco, which is a repeat of the *Yucatan*, launched by the builders last month. The vessel is intended for passenger and general carrying trade in the Gulf of Mexico, and has a poop, shade deck, and topgallant forecastle. Handsome accommodation is provided for 50 first-class passengers, including saloon, smoke-room, &c. Every arrangement has been made for the efficient working of the vessel, and the machinery, which is on the triple-expansion principle, is being supplied by Messrs. R. Napier & Sons, Limited, of Glasgow. She has been built to Lloyd's highest class, and under the superintendence of Mr. James Rode, of Liverpool. The ceremony of naming the vessel *Tehuantepec* was performed by Miss Bessie Wood, Williesle a, Dumbarton.

Tintagel Castle.—On September 12th the *Tintagel Castle*, a single-screw steel steamer of 5,600 tons gross, was launched from the yard of the Fairfield shipbuilding and Engineering Co., Limited, Govan, for the Castle Mail Packets Co., Limited, a large number of guests being invited. The new vessel is classed 100 A1 at Lloyd's, is 440 ft. in length, 50 ft. in breadth, and 33 ft. in depth. She has a straight stem and elliptical stern, a capacious poop, a very long bridge, and a topgallant forecastle, and will be rigged as a four-masted schooner with yards on the foremast. The rake and spacing of the masts, in conjunction with an imposing funnel, will present a particularly pleasing effect. Internally the vessel is divided into numerous watertight compartments, and there is a double bottom running the whole length, which again is subdivided into various compartments for carrying water ballast. The cargo holds are five in number, and will have capacity for about 6,000 tons of cargo, each hold having a separate hatch and double steam winches for quick despatch in loading and discharging. The main hatch is specially constructed to take in boilers and mining machinery of the largest dimensions, for lifting which a steel spar is provided, along with adequate gins and steel wire gear. The passenger accommodation is commodious, and will be extremely comfortable. There are about 170 first and second class berths placed amidships, with dining saloons, drawing and smoking rooms for each class. Libraries and musical instruments will be also provided. A very large proportion of the sleeping rooms are fitted for two persons only, sub-division and privacy being specially aimed at. A few family cabins for four are also provided. The third-class passengers have the poop and after 'tween decks entirely to themselves. These are suitably divided into cabins of various sizes. Each bed has a spring mattress, and each cabin separate toilet fittings and electric light. The dining-rooms are spacious, and will be upholstered throughout, and the sanitary quarters are well supplied with baths. The culinary arrangements are carried out in a thorough and efficient manner, and are equal to those in the best hotels. A cold storage is provided for the provisions: the kitchens have roasting ovens, baking ovens, grills, entrée and pastry presses, potato steamers and steam boilers; and each class has a separate pantry containing steam carving table, with provision for hot plates underneath, thus ensuring that the food is well cooked and served to the table hot. The decks are very spacious, and there is ample room for recreation, abundance of seats also being provided. The equipment of boats, &c., is of the highest class for a first-class passenger steamer. The machinery is triple-expansion, with three cylinders and three cranks working at a high pressure from three tubular steel boilers. The shafting is of forged ingot steel, and the propeller is of bronze. All are designed on modern principles, to obtain thorough efficiency and economy with little vibration. The power developed will ensure a regular speed to South Africa of about 13 knots per hour. The launch was successfully accomplished shortly before four o'clock, the naming ceremony being performed by Miss Olivia Fox, Falmouth. The vessel was immediately taken into the Fairfield Co.'s private dock, where she will be fitted out, and the launching party adjourned to the offices for luncheon.

Peru.—On September 19th Messrs. Caird & Co., Limited, Greenock, launched from their yard a twin-screw steamer of 2,800 tons gross for the Pacific Steam Navigation Co. Her dimensions are as follows:—Length, 350 ft.; breadth 43 ft.; depth, 23 ft. 3 in. The vessel, which is named the *Peru*, is intended for the company's passenger, cargo, and cattle trade. She is a sister ship of the *Chile*, which was recently launched, and is intended for service between Valparaiso and Panama.

Crater, Cygnus, Lupus.—On Saturday, September 19th, Messrs. Mackie & Thomson, Govan, launched the *Crater*, the *Cygnus*, and the *Lupus*, steam trawlers built for the Grimsby and North Sea Steam Trawling Co., Limited. The vessels, which are fitted with the new otter gear, are 96 ft. 6 in. between perpendiculars, 20 ft. broad, and 11 ft. 6 in. (moulded) deep. Triple-expansion engines will be supplied by Messrs. Muir & Houston, Kinning Park.

Cervona.—On September 21st Messrs. Charles Connell & Co. launched from their Scotstoun shipbuilding yard a steel screw steamer, built to the order of Messrs. William Thomson & Sons, Dundee, for their Canadian and general trade. Her dimensions are:—Length between perpendiculars, 368 ft.; extreme breadth, 45 ft.; depth, moulded, 29 ft. 3 in.; with a deadweight carrying capacity of about 5,800 tons. She has been built to Lloyd's highest class as a strengthened spar-decker, with shelter deck almost the whole length of the vessel. Accommodation is provided in houses on shelter deck for saloon, captain, officers, engineers, and a few passengers, all being fitted up in a handsome and comfortable manner, the crew being berthed forward under shelter deck, while accommodation is provided for cattlemen aft under shelter deck. The vessel has a cellular double bottom for water ballast all fore-and-aft, the peaks also being fitted as ballast tanks. She has six large hatches, fully equipped with eight steam winches and double derricks completely arranged for speedy loading and discharging, while she is fitted with a powerful steam windlass, steam steering gear, and all the most modern appliances for the safety and efficient working of the vessel. She will be rigged as a two-masted fore-and-aft schooner, with telescopic topmasts to suit the Manchester Canal. The engines—which are being constructed by Messrs. Dunsmuir & Jackson, Govan—are of the most improved triple-expansion type, having cylinders 27 in., 43 in., 71 in., by 48 in. stroke, steam being supplied by two single-ended boilers, suitable for a working pressure of 160 lbs., and fitted with Howden's system of forced draught. Both hull and machinery have been constructed under the personal supervision of Mr. William Ross, the owners' superintendent engineer, and of Mr. James Cant. This is the first of two vessels under construction for the same firm, and as she left the ways was named *Cervona* by Mrs. William Thomson, jun., wife of one of the partners.

Sui Wo.—On September 21st The London and Glasgow Engineering and Iron Shipbuilding Co., Limited, launched from their yard at Govan, the twin-screw steamer *Sui Wo*, built for the Indo-China Steam Navigation Co., Limited, London. The vessel, which is a sister ship to the *Kut Wo*, delivered about twelve months ago to the same owners, is of a very special design, and is intended for the Yangtse River, China. The principal dimensions are:—Length, over all, 301 ft.; breadth, over all, 54 ft. 6 in.; depth, from top deck, 29 ft. 3 in.; gross tonnage, about 2,800. The hull is of steel, and of very much heavier scantlings than those of the ordinary river steamers of that country. The main deck is steel throughout, and the upper and awning decks, which extend all fore-and-aft, are of pine, covered with canvas. On the upper deck there is sleeping and saloon accommodation for 220 third-class and 130 first-class Chinese passengers in a large deck-house extending nearly all fore-and-aft. These spaces are thoroughly well lighted and ventilated to suit the hot season, and can also be heated with steam during the cold season. The European accommodation is on the top deck, and consists of a large central deck-house, with saloon, passengers' cabins, captain's room, and wheel-house. Side-houses are provided for the engineers, officers, pilots, &c., and all are fitted up in first-class style. There is a guard all round the ship at the main deck, and the fore part of the vessel is built out to meet it. Gangway doors are fitted at each of the four cargo hatches, and as the cargo is loaded and discharged by porters, there are no winches to disturb the passengers. The hatches and gangways are all on the main deck. Cargo stages are fitted in all the hatches from the hold to the main deck, all the cargo being handed from stage to stage until it reaches the deck. The vessel has steam windlass in the forecastle, with capstan above; also steam warping capstan aft. Caldwell & Co.'s steam steering gear is fitted in the engine-room, and the vessel is lighted throughout by electricity, this work being by Messrs. J. H. Holmes & Co., Newcastle. The machinery consists of two sets of triple-expansion engines capable of developing 1,500 I.H.P. The cylinders are 14 in., 23 in., and 37 in. diameter, and the stroke 30 in. There are two boilers, 13 ft. 3 in. diameter by 10 ft. 6 in. long, working at a pressure of 160 lbs. They are fitted with Howden's system of forced draught. A horizontal tubular boiler is also provided for working the auxiliary engines. As the vessel left the ways she was gracefully named the *Sui Wo* (which is in English *Propitious Harmony*), by Miss Muriel Keswick, of Eastwick Park, Leatherhead, Surrey. The vessel was afterwards towed to Finnieston crane to receive her machinery, which the builders supply. The steamer is to leave for China early in October, and will be commanded by Captain Robert Arthur Binns, who is well known on the China coast.

Lakne.—On September 23rd, at Linthouse, a fine steel screw steamer of 100 A1 spar deck class, built by Messrs. Alex. Stephen & Sons for Mr. A. C. Le Quellec, Bordeaux, was launched. The dimensions of this steamer—which is the seventh vessel built at Linthouse for Mr. Le Quellec—are 330 ft. by 43 ft. 2½ in. by 27 ft. 2 in.; and she carries about 4,500 tons deadweight. She has poop, bridge-house, and top-gallant forecastle; the accommodation for captain and officers, along with spare state-room, being fitted in poop; the engineers being located under bridge, and the crew in the forecastle. Provision is made for water-ballast in double bottom, and the installation of appliances for working the ship and loading and discharging cargo, is of the most ample and efficient character. The engines—also constructed by Messrs Stephen—have cylinders 22 in., 37 in., and 62½ in. diameter by 42 in. stroke, with two single-ended boilers working at a pressure of 200 lbs. The construction of hull and machinery has been superintended by Messrs. Wm. Esplen & Son, Liverpool. The ship was named *Lakne*, by Miss Amy Wright, 14, Belhaven Terrace.

Amasis.—Messrs. Charles Connell & Co., Whiteinch, have launched from their Scotstoun shipbuilding yard lately a large steel screw steamer, built to the order of the Kosmos Co., Hamburg. Her dimensions are:—Length, 370 ft.; breadth, 46 ft. 6 in.; depth, moulded, 30 ft.; with a deadweight capacity of 6,200 tons. She has been built to English and German Lloyd's highest class, having cellular double bottom right fore-and-aft for water ballast. Each hatch is equipped with winches and derricks, completely arranged for speedy loading and discharging. Accommodation is also provided for a number of first, second, and third-class passengers. The engines, which are of the most approved quadruple-expansion type, having cylinders 21½ in., 31½ in., 45 in., and 64 in. by 45 in. stroke, worked by three single-ended boilers, are being constructed by Messrs. David Rowan & Son, Glasgow. As the vessel left the ways she was named *Amasis* by Mrs. Saggan, wife of Captain Saggan, who has superintended the construction, and takes command of the vessel.

Terror.—Last month Messrs. James and George Thomson, Limited, launched from their yard at Clydebank a torpedo-boat destroyer of 380 tons, which has been built to the order of the

Spanish Government. She was named *Terror*, and is a duplicate of the *Furor*, launched from the same yard.

LAUNCHES—IRISH.

Gascon.—On August 25th Messrs. Harland & Wolff, of Belfast, launched the *Gascon*, the first of three new 6,000-ton steamers which the firm is building for the Union Steamship Co.'s South African service. She is a steel twin-screw steamer, and will have unusually complete accommodation for passengers. The *Gascon* is similiar in design but larger than the four "G's" already in the Union Co.'s fleet.

Pennsylvania.—On September 10th the twin-screw steamer *Pennsylvania*, built by Messrs. Harland & Wolff for the Hamburg-American Steam Packet Co., was launched from the Queen's Island, at Belfast. The *Pennsylvania* is the largest vessel ever built by Harland & Wolff, and much gratification is felt locally at the placing of so important a German order with the great Irish firm. The steamer's deck measurement is 585 ft.; beam, 62 ft.; and depth from keel to awning-deck 42 ft. Her displacement will be little less than 30,000 tons, and she will be engined with quadruple-expansion engines with 6,000 I.H.P., giving an average speed of 14 knots. She is fitted up for 200 first-class, and 150 second, and 1,000 steerage passengers. The Lord Mayor, Alderman Pirrie, and Mr. W. H. Wilson, partners in the firm of Harland & Wolff, were present at the launch, and the Hamburg-American Co. were represented by Mr. C. Van Der Smissen and Captain Kopff.

LAUNCH—NORWEGIAN.

Hafnia.—On September 12th was launched from the yard of the Bergen's Mekaniske Værksted, Bergen, a steel screw steamer of the following dimensions:—Length, over all, 226 ft.; breadth, moulded, 31 ft. 6in.; depth, 15 ft. 3 in. The ship is built to the highest class in The Norwegian Veritas, and has raised quarterdeck, bridge and topgallant forecastle; double bottom for water ballast in main and after holds, and peak tank aft, steam steering gear, steam windlass, three steam winches, donkey-boiler, &c. Every modern improvement has been embodied in her construction and outfit. She is built especially for the Baltic wood trade. The engines are triple-compound with cylinders $15\frac{3}{4}$ in., 25 in., 42 in., diameter, and 30 in. stroke. One steel boiler, constructed for a working pressure of 160 lbs. per square inch. Speed 9 knots. The ship was named *Hafnia*, and is built to the order of William Hansen, Esq., of Bergen.

LAUNCH.—FRENCH.

St. Louis.—On September 8th the French battleship *St. Louis* was launched at Lorient. The *Gaulois* is to take the water at Brest on October 6th. Both these are sister ships of the *Charlemagne*. They have been built from the plans of M. Thibaudier, and the *Gaulois* takes the place of the *Henri IV.*, of which the name has been conferred upon a smaller coast-defence armour-clad. The *St. Louis* and her younger sister displace 11,275 metric tons, and are 385 ft. 6 in. long, with 66 ft. 6 in. beam, and 27 ft. 6 in. draught. Three triple-expansion engines driving as many screws are supplied by 20 sets of Belleville boilers, with a maximum of 14,000 H.P. (forced draught), giving a speed of 18 knots. The extreme coal capacity is 1,000 tons. The *St. Louis* was ordered to be put in hand in September, 1893, but she was not actually begun until later, and the end of 1899 is mentioned as the date of completion.

LAUNCHES.-GERMAN.

Barbarossa.—On September 5th the new twin-screw passenger and freight steamer *Barbarossa*, which has been built for the North-German Lloyd Co., was successfully launched from the yard of Messrs. Blohm & Voss, at Hamburg. The vessel was christened by Frau Weigand in the presence of a distinguished company.

Heligoland.—On August 10th a steel steam trawler was launched at Geestemunde, owned by the Oldenburger Hochseefischerei, Ges., Oldenburg.

Herbert.—On August 10th a steel steam trawler was launched at Geestemunde, owned by Mr. P. Wurthmann, Geestemunde.

St. Johann.—On August 1st a steel steam trawler was launched at Geestemunde, owned by Mr. Julius Wieting, Bremerhaven.

LAUNCH.—AUSTRIAN.

Bohemia.—On August 24th the *Bohemia*, a steel schooner-rigged steamer of about 4,000 tons, built for Lloyd-Austriaco, of Trieste, was launched at Trieste.

TRIAL TRIPS.

Harbury.—On August 21st the screw steamer *Harbury*, built by Messrs. S. P. Austin & Sons, and engined by Messrs. Geo. Clark, Limited, ran a trial off the Wear. She has as carrying capacity of 2,600 tons, and is specially built for the coal trade. She is 268 ft. long, $37\frac{1}{2}$ ft. beam, and 17 ft. deep and has a gross tonnage of 1,838 tons, net 1,146. Her engine are of 170 N.H.P. The speed attained in the laden run over the measured mile was 11·72 knots per hour. She is owned by Messrs. J. & C. Harrison & Co., of Mark Lane, London, and will be principally employed in the Welsh trade.

Wakatere.—On August 26th the trial trip of the new paddle steamer *Wakatere* took place. She is of 440 tons and 1,800 H.P., and has been built by Messrs. Napier, Shanks & Bell for the Northern Steamship Co., Auckland (N.Z.), and is similar in construction to the *Neptune* and *Mercury*, built by the same firm, although the new steamer has extra accommodation in the way of smoking-room, card-room, &c. The *Wakatere* measures 210 ft. long by 26 ft. broad, and has been built on a No. 2 Board of Trade certificate. The new steamer is splendidly appointed. The ventilation has been arranged with a special regard for a hot climate. The saloon is done up in light polished oak, and upholstered in spring cushions of Utrecht velvet. The dining saloon is beautifully decorated in white and gold, and is admirably cool. The steamer has been engined by Messrs. Bow, M'Lachlan & Co., of Paisley, and was built under the superintendence of Mr. Darling and Captain Farquhar, who takes the vessel to New Zealand. The run was made for the Cumbraes, which the steamer twice rounded. Favoured by a bright sunshine, the imposing scenery was seen to the fairest advantage. The certified rate of speed of the *Wakatere* is 16 knots. It is satisfactory to know that she almost reached that speed. The *Wakatere* starts on her voyage to New Zealand in a few days.

Denton Grange.—On August 27th the latest addition to Messrs. Houlder Brothers & Co.'s fleet—the *Denton Grange*—had her trial trip in Belfast Lough, previous to taking her place in their regular trade between London, Cardiff, Newport, South America, Australia and the Cape. Her dimensions are:—Length, 420 ft.; breadth, 54 ft.; depth, 32 ft. 5 in.; gross tonnage, 5,850. She is the third vessel built for Messrs. Houlder by Messrs. Workman, Clark & Co., Belfast, and the machinery has also been constructed at their engine works both being specially designed to suit the many requirements of a vessel engaged in a large cargo and passenger trade, and complying with Lloyd's highest class and Board of Trade regulations. The vessel can be loaded to a draught of 26 ft., and is capable of carrying a deadweight of about 8,500 tons. The machinery is capable of developing an I.H.P. of over 3,200, and includes all the most recent improvements, with pumps and auxiliary engines by the best manufacturers. The boilers are supplied with Howden's forced draught, and are three in number. The cargo can be loaded or discharged in the most expeditious and perfect manner from five different hatchways by means of four derricks, each lifting five tons, and worked by powerful steam frictional winches. As a large stowage capacity is one of the principal considerations of the homeward voyage when carrying frozen meat, an improved construction has been introduced in the hold, the large hold beams being dispensed with in favour of continuous side stringers, which give a small projection only beyond the insulation. The refrigerating of a vessel of this size is in itself a work of great magnitude, the insulated holds having to be double sheeted with charcoal in between the partitions and pipes through which the brine is circulated and carried all round. The various appliances for navigating and working cargo have been supplied similar to those in the *Langton Grange*, and nothing is wanting to make the vessel one of the most complete cargo and passenger vessels in the trade. On the bridge deck, which extends for about 200 ft. amidships, is placed a large steel deckhouse, containing accommodation for the first and second-class passengers, officers and engineers, &c. The first-class saloon is placed in front, and is upholstered in blue corded velvet, the framing being of oak in various shades, with furniture to suit, and the ceiling panelled with lincrusta, with carved oak cornices. The state-rooms are convenient to the saloon, and are large, well-ventilated, and comfortably fitted up in the modern style, with spring mattresses, patent lavatories, &c. The second-class rooms and saloon are placed in the after end of the house, along with the officers' and engineers' accommodation. Provision has been made for carrying a large number of cattle, and suitable gangways made through the bridge sides for shipping. In view of the vessel at any time being required for transport services, &c., the 'tween decks have been lighted fore and aft by a tier of side lights. Electric lighting is introduced to every place where light is required, and includes cargo clusters and arc lamps for night loading, and the lamps and fittings in the passengers' accommodation are plated. The construction of the vessel has as usual been carried out under the supervision of Mr Copeland K. Etheridge, the owners' marine superintendent, and the machinery department under Messrs. Esplin, Son & Swanston. During the afternoon, the *Denton Grange*, with a company on board representing the owners and builders, cruised about Belfast Lough. Several trial runs were made, the average speed attained being 13½ knots.

Falcon.—On Saturday, August 29th, the s.s. *Falcon*, built by the Sunderland Shipbuilding Co., Limited, was taken to sea on her official trial. Her dimensions are :—152 ft. b.p., 25 ft. 6 in. broad, by 12 ft. 4 in. moulded depth, built to the highest class at Lloyd's under special survey, having short full poop and topgallant forecastle, connected together by a shade deck. A deck-house aft is fitted up for officers and engineers, and also contains entrance to the saloon and state-rooms in the poop. Amidships a large house is fitted containing captain's and passengers' berths, and the crew are berthed in the topgallant forecastle. Special attention has been paid to the ventilation throughout, as the vessel is to trade in the Red Sea, and will carry passengers, mails, and cattle. She is also arranged to pass the Indian Marine Law. The vessel is provided with steam winch and steam crane by Messrs. Clarke, Chapman & Co., and has extra large cattle doors under shade deck to facilitate transport of live stock; combined hand and steam steering gear by Messrs. Davis & Co., patent windlass by Messrs. Emerson, Walker & Thompson Bros., Limited. The engines are tri-compound, having cylinders 13½ in., 22 in., and 36 in., by 24 in. stroke, 160 lbs. pressure, by Messrs. Sir Christopher Furness, Westgarth & Co., Limited, Middlesbrough-on-Tees. During the whole period of the vessel's trial the engines worked at full speed without a hitch, and a mean speed of considerably over 11 knots was obtained. The *Falcon* is built for Messrs. Luke Thomas & Co., Limited, of London and Aden, and is designed for their special trade. During construction both hull and machinery have been inspected by Mr. F. J. Trewent, of London, and Captain Bowman, of Greenock, on behalf of the owners.

John Christie.—On September 4th the new steamer *John Christie*, built by Messrs. Short Brothers, to the order of the Aktie Selskabet Hekla, of Christiania, went out on trial with very satisfactory results. The vessel has been specially designed for the timber trade, and has been constructed of steel to the highest class in Lloyd's and Det Norske Veritas.

Liv.—On September 5th the steamship *Liv*, which has been built by Messrs. Ropner & Son, of Stockton-on-Tees, for Bergen owner, left the Tees for her official trial trip. Her compasses having been duly adjusted a satisfactory run was made, the owner being present and expressing himself highly pleased with the performance, both in regard to the vessel and her machinery.

Balderton.—On September 7th the steel screw steamer *Balderton*, a vessel built by Messrs. Wm. Gray & Co., Limited, to their own order, left the port of Hartlepool for her trial trip. She has been built to Lloyd's highest class, and is of the following dimensions:—Length, over all, 324 ft.; breadth, 44 ft.; and depth, 23 ft. 3 in. The deck erections consist of a poop, bridge over machinery space, and topgallant forecastle. A handsome saloon, and cabins for officers, &c., are fitted in the poop, the engineers' rooms are in the bridge, and the crew's accommodation forward. The hull is built on the web-frame system, with a cellular double bottom, large hatchways, powerful steam winches, steam steering gear amidships, hand screw gear aft, large donkey boiler, patent direct steam windlass, boats on beams overhead, shifting boards throughout, stockless anchors, two masts with schooner rig, and a complete outfit for a first-class cargo vessel. The engines are of the triple-expansion type, supplied by the Central Marine Engine Works of Wm. Gray & Co., Limited, and have cylinders 23 in., 36½ in., and 62 in. diameter, with a piston stroke of 39 in., and two large steel boilers working at a pressure of 160 lbs. per square inch. The trials were of a very satisfactory character, and on their conclusion the vessel proceeded to Sunderland to load her first cargo. This vessel is noteworthy on account of her engines being fitted with the first air pump that has been sent to sea of the type known as Edwards's patent. This pump is designed by Mr. Fred. Edwards, of 62, Bishopsgate Street Within, London, E.C., and represents a valuable step in advance in the design of air pumps. Its principal peculiar feature lies in the fact of its having no valves within the pump, where they are difficult to get at; that is to say, there are neither foot valves nor bucket valves, both of which Mr. Edwards find unnecessary. The only valves there are are the head valves, and these being outside the pump in the atmosphere, are arranged so that they can be got at through a door or cover and cleared, or even changed, without stopping the pump and without loss of vacuum. The pump ran in a perfectly satisfactory manner on the trial trip, maintaining a vacuum in the condenser of 29 in. of mercury. Its success was therefore demonstrated to be entirely beyond question. The trials were witnessed by Mr. Edwards and other gentlemen interested, Captain Murrell representing the shipbuilders.

Aysgarth.—On September 8th the new steamer *Aysgarth*' built by Messrs. John Readhead & Sons, West Docks, South Shields, to the order of the Clapham Steamship Co., Limited, Newcastle, was taken to sea on her official trial trip. The vessel is of the improved single-deck type, having poop aft and long bridge, with accommodation for officers, and topgallant forward for crew, and is of the following dimensions :—323 ft. in length, 47 ft. broad, and 25 ft. deep, moulded, her deadweight capacity being about 5,150 tons on a light draught. The vessel has been fitted with tri-compound engines, also constructed by Messrs. John Readhead & Sons. The trial was in every respect satisfactory, an average speed of 11½ knots being attained. The owners were represented by Mr. G. E. Macarthy (director), the builders being represented by Alderman Readhead and Mr. John Readhead.

Rotterdam.—On September 9th the steel screw steamer *Rotterdam*, which Messrs. Gourlay Brothers & Co., of Dundee, about six months ago contracted to build for Messrs. James Rankine & Son, of Glasgow, made her official trial trip. The steamer left Camperdown Jetty and proceeded on a trip to Arbroath. On returning to the Tay in the afternoon the *Rotterdam* came to anchor in the roads, and luncheon was served in the saloon. Mr. Charles G. Gourlay occupied the chair. After the luncheon the steamer ran the measured mile, which was accomplished in a little over four minutes. The rate of speed attained by the vessel averaged 14 knots per hour. Her triple-expansion engines were thoroughly tested, and these were found to work satisfactorily.

Glenturret.—On September 12th the screw steamer *Glenturret*, the latest addition to the Glen line of Messrs. M'Gregor, Gow & Co., London, went on her trial trip in the Firth of Clyde. The vessel is the nineteenth built by the London and Glasgow Engineering and Iron Shipbuilding Co., Limited, for Messrs. M'Gregor, Gow & Co., and is 400 ft. long b.p. by 49 ft. by 31 ft. moulded, and has a deadweight carrying capacity of 7,000 tons. The engines are of the triple-expansion type, with cylinders 29 in., 47 in., 77 in. diameter, by 54 in. stroke, steam being supplied by three large single-ended boilers, 170 lbs. working pressure, fitted with Howden's system of forced draught. The vessel was tried between the Cloch and Cumbrae lights, and proved in every way satisfactory, a speed of 14·6 knots being easily maintained. The engines worked at 80 revolutions, indicating 3,560 H.P. The owners were represented by Captain Duke and Mr. W. C. Roberts, the Board of Trade by Mr. Mott, and Lloyd's by Mr. Stromeyer and Mr. Cooper.

India.—On Saturday, September 12th, the trial trip of the new steamer *India*, built by Messrs. Caird & Co., Limited, Greenock, for the Peninsular and Oriental Steam Navigation Co., took place. A large company of ladies and gentlemen, numbering nearly 300, and connected with all parts of the United Kingdom, being invited. The *India* is a vessel of 8,000 tons gross register, with an I.H.P. of 10,000. She is 500 ft. in length; 54 ft. in breadth; and 37½ ft. in depth. The engines, which were supplied by Messrs. Caird, are on the triple-expansion principle, with four cylinders and four cranks. The boilers are fitted with Howden's forced draught system, and the shafting is of Vicker's steel. The various decks are fitted with all the most recent appliances for the handling of cargo, worked by hydraulic power. The vessel has been fitted throughout with a complete electrical installation by Messrs. Siemens Brothers. The speaking tubes fitted on board by Messrs. Durham, Churchill & Co., London, created much interest, their efficiency, with the engines going at full speed, being perfect. The *India*, which has been built to the highest class at Lloyd's, is the largest steamer ever built at Greenock. She is intended for the mail and passenger service of the P. & O. Co., and has been placed on the Admiralty list of armed cruisers. She can in time of emergency accommodate fully 2,500 soldiers. Her crew consists of from 400 to 500 persons, including stokers and engineers. The steamer has five decks—boat deck, promenade deck, spar deck, main deck, and lower deck. She is fitted up to accommodate 469 passengers—317 first-class and 152 second-class. On September 4th, the steamer was run over the measured mile at Skelmorlie, and while no figures are given, the results were highly satisfactory to the builders. The *India* is one of six steamers at present being built. Two of these—the *Egypt* and the *Arabia*—are being built at Greenock by Messrs. Caird, one—the *China*—by Messrs. Harland & Wolff at Belfast, and another—the *Socotra*—by Messrs. Palmer at Jarrow. The internal fittings of the various apartments in the *India*, which have been furnished by Messrs. J. G. Rowan & Co., Greenock, under the superintendence of Mr. T. E. Colcutt, leave nothing to be desired. In the main saloon the prevailing colours are white and gold, and the walls and ceiling are a triumph in decorative art. The first saloon smoking-room is perhaps the prettiest room in the vessel. It is fitted up with oak panels, green stained, and art decorations in the shape of handsome seascapes and landscapes are placed all round. The room itself is supplied with all the latest improvements, including smoking tables, tumbler racks, while the floor is formed of rubber squares. The music-room, which is situated at the companion-way above the main saloon, is furnished in two shades of red, in French velvet, and is fitted up with African mahogany. A fine library is also contained in this room. The various state-rooms, first and second-class, are supplied with folding beds, folding washstands, writing-desks, and chests of drawers. The baths, which are of marble, have been hewn out of the solid. The second saloon and smoking-room are quite in keeping with the others; in fact, very little difference is noticeable in the furnishings, which are as handsome and luxurious as in the first saloon apartments. About mid-day the vessel, which is in command of Captain Briscoe, proceeded down the Firth, arriving back at the Tail of the Bank about six o'clock, a very enjoyable day having been spent.

Rameses.—On September 15th the new screw tug *Rameses*, built by Messrs. G. Rennie & Co., of Greenwich, and engined by Messrs. Plenty & Son, of Newbury, to the order of Messrs. W. Cory & Son, went down the Thames for her trial trip. The weather was rather stormy, but notwithstanding this, a speed of 10·6 knots was obtained as a mean of four runs over the measured mile. The dimensions of the vessel are: 75 ft. by 15 ft. by 8 ft. 2 in.. The engines are of the compound condensing type, having cylinders 16 in., 32 in. by 18 in. There is one boiler 10 ft. 6 in. diameter, by 10 ft. long—125 lbs. working pressure, the engines indicated 335 H.P., revolutions, 146; boiler pressure, 125 lbs. The trial was in every way satisfactory.

Corcovado.—On September 16th, the trial trip of the s.s. *Corcovado* took place, and judging from the results obtained the policy of the Pacific Steam Navigation Co., the oldest or one of the oldest of the great steam-shipowning companies, in placing their orders for high-class cargo steamers with C. S. Swan & Hunter, Limited, of Wallsend, has been amply justified. The Pacific Steam Navigation Co. was incorporated by Royal Charter in 1840, and has been from the first abreast of the times, having so far back as 1858 discarded the simple for the compound engine, and also used a marine type of water-tube boiler designed by the late Mr. John Elder. The *Corcovado*, which is the first of two steamers building for the above company by C. S. Swan & Hunter, Limited, is 405 ft. long over all; 47 ft. beam; and 32 ft. 9 in. depth, moulded. She has been constructed from the designs prepared by the builders in conjunction with Captain Conlan and Mr. J. Thompson, of the Pacific Steam Navigation Co., to carry a dead weight of 6,700 tons for the trade between Liverpool and the various Pacific ports. In the construction, the classification of Lloyd's and other registries has been dispensed with, but the scantlings are in excess of their requirements. The steamer is adapted for all classes of trade, having three decks laid, and a large number of subdivided holds, side hatches, and a most complete equipment of high-class loading and discharging gear, including nine very powerful winches made and supplied by Messrs. J. H. Wilson & Co., of Liverpool, as well as electric light throughout, both for lighting the various quarters, and for discharging cargo. All the other fittings on the vessel are of the highest class, and the steamer may rank as one of the most complete cargo steamers which has ever been turned out. The propelling machinery has been supplied by the Wallsend Slipway and Engineering Co., and is of a high-class character, including all the most modern appliances for the economical propulsion, with propeller of the Manganese Bronze Co.'s bronze. During the exhaustive series of trials the builders were represented on board by Mr. G. B. Hunter, the chairman of C. S. Swan & Hunter, Limited, Mr. C. S. Swan, Mr. De Rusett, and Mr. Stephenson; whilst the engine builders were represented by Mr. William Boyd, managing director, Mr. L. Rusden, and Mr. Wallis. The trials were commenced with a series of runs on the measured mile, the mean speed then obtained being 12·98 knots, after which the trial of 100 miles was undertaken, the mean speed of which was 12·58 knots, with 4,600 tons deadweight. During these trials the engines worked in the most satisfactory manner, and the company's officials, who were represented by Captain Conlan, their marine superintendent, and by Mr. Thompson, engineering superintendent, expressed themselves as being perfectly satisfied in every way with the ship's performances, the speed being considerably in excess of the contract requirements; in fact, so excellent was the performance that gratification was expressed on all sides that such a highly satisfying result should have been obtained. About 8.30 p.m., the visitors having returned to shore, the s.s. *Corcovado* headed for Liverpool, where she will complete her loading, and where she will be formally inspected and taken over by the Pacific Steam Navigation Co. The *Corcovado* is the first steamer the Pacific Steam Navigation Co. have had built in the North-East district, but it is fully expected that the excellent performances shown by this vessel, as well as the high finish and beautiful model, will be the means of obtaining for C. S. Swan & Hunter, Limited, further orders from these and other Liverpool owners. A second vessel for the same company is well forward in the builders' yard.

Corocoro.—On Wednesday, September 16th, the steamer, *Corocoro*, which has been built by Messrs. Wigham Richardson & Co. at their Neptune Works, Newcastle-on-Tyne, went for a very successful trial trip off the coast. The vessel is built of steel, 379 ft. in length by 48 ft. beam, she has a poop, bridge and topgallant forecastle, and is rigged as a fore and aft schooner. Messrs. Wigham Richardson & Co. have also constructed the engines, which are on the triple-expansion principle, and the boilers, which are fitted with Serve tubes and Ellis & Eave's system of induced draught. The steamer has also an installation of electric light, eight powerful steam winches, steam windlass, &c. The steamer has been constructed to the order of the New York and Pacific Steamship Co., Limited, of London, for their West Coast Service. Mr. Grace, of the firm of W. R. Grace & Co., London, managers of the New York and Pacific Steamship Co., Limited, was present at the trial trip, as well as Mr. Todd, of London, the superintendent engineer for the company, under whose care the vessel has been built, and Mr. Wigham Richardson and Mr. John Tweedy, of the builders' firm. During the trial trip the machinery worked without the slightest hitch, giving satisfaction to all concerned, and the ship attained a speed of 12½ knots.

Maceio.—On Saturday, September 19th, the screw steamer *Maceio*, constructed at the Cleveland dockyard of Sir Raylton Dixon & Co., for the Hamburg Sud-Amerikanische Damffschifffahrts Gesellschaft, was taken out to sea for her official trial trip, under the command of Captain A. Simonsen. The vessel is of the spar deck type, and built to Bureau Veritas highest class, under the supervision of Mr. F. G. Dietze, and has been specially designed and fitted to meet the company's passenger and general trade to Rio Grande. The principal dimensions are:—Length, 310 ft. 6 in.; beam, 41 ft. 2 in.; depth, moulded, 28 ft, with a deadweight carrying capacity of about 4,000 tons on a light draught. The first-class passenger accommodation is fitted up under the bridge with dining saloon in house on bridge deck. Commodious and well-ventilated quarters for about 326 emigrants are also provided aft in poop and 'tween decks. Triple-expansion engines have been fitted by Messrs. Thomas Richardson & Sons, Limited, Hartlepool, having cylinders 20 in., 33 in., 57 in. by 45 in. stroke, supplied with steam by two large boilers working at 205 lbs. pressure. At the conclusion of the trials, which were very successful and satisfactory, the vessel proceeded to Hamburg to load for South America.

Narrung.—On Saturday, September 19th, the s.s. *Narrung*, built by the Sunderland Shipbuilding Co., Limited, to the order of W. Lund, Esq., of London, was taken to sea on her trial trip, this being the fourth vessel constructed by the above firm for this gentleman. The dimensions of the steamer are as follows:—Length, B.P., 400 ft.; breadth, 48 ft.; depth, moulded, 31¼ ft. Classed 100 A1 Lloyd's. The vessel has been specially designed for the owner's line running between London and Australia. Her carrying capacity is 6,000 tons. Accommodation is also fitted for 30 first-class passengers and 30 third-class passengers. The steamer is built with long full poop and topgallant forecastle, with long citadel bridge, at the forward end of which is placed accommodation for captain and first-class passengers, together with lavatories, bath-rooms, and rooms for stewardess, &c. At the after end of this bridge accommodation is fitted for the officers, engineers, and apprentices, also purser and refrigerating engineers, together with officers' and engineers' mess-rooms. On top of this bridge deck a large house is built, containing berths for several first-class passengers, doctor, and steward, also bar and pantries. At the fore end of this house, and forward of the machinery space, there is a large dining-saloon for first-class passengers 34 ft. by 24 ft., which is panelled out in various shades of polished oak. Handsome mirrors are fitted with carved oak caps and moulding relieved with gold, the whole of the fittings being of solid white metal. There are three dining tables with revolving chairs, also sofas, bookcases, sideboards, &c., complete, this saloon is specially lighted and ventilated with dome skylight and large sidelights all round. On the top of main saloon is a large music-room, fitted in light oak with a number of mirrors and tastefully fitted. This room is also lighted by a large dome skylight. In close proximity to the saloon is a large smoking-room, fitted in light oak and mirrors, luxuriously fitted with lounges, tables, &c., complete. Covering all this accommodation is a complete shade deck, extending to the sides of the vessel, forming a promenade for the first-class passengers 120 ft. by 48 ft., the only erection upon which is the captain's house and steering house, the former is handsomely fitted up in oak and mahogany with sleeping berth, slate top, chart table, etc. Accommodation for third-class passengers is placed in the topgallant forecastle whilst the crew are all berthed in the full poop aft. The galley is fitted underneath the bridge so as to be conveniently placed for the stewards and cooks, and is of exceptionally large dimensions, the height being 16 ft. The range, steam and bakers' ovens, &c., are of extra large size, and have been supplied by Messrs. Binko & Co., of London. The steam steering gear stands in the engine-room casing, at the after end, and is connected to the wheel-house on the shade deck by rods and bevelled gear. The after steering gear is of extra size and power, by Mr. John Lynn, of Pallion. There are eight steam winches for working the cargo, which have been built to the owner's special requirements with extra large drums, &c., by Mr. Robert Welford, of Pallion. Powerful steel derricks, &c., are fitted, and all gear for handling light and heavy cargoes. Abreast the main mast there are two large side houses, built with complete accommodation for quarter-masters, carpenters, boatswains, and the various petty officers, including mess-room, for same, etc. The whole vessel is entirely lighted throughout by electricity, and is also heated by electric radiators by Messrs. Binko & Co. The whole of the fore hold and fore 'tween decks, which are of very large capacity, have been insulated by Messrs. Johnson & Co., of London, for the carrying of frozen meat. The necessary refrigerating machinery, which stands immediately above this hold, is manufactured by the Haslam Foundry and Engineering Co., of Derby, the steam for driving this machinery is obtained from a large multitubular auxiliary boiler, built by The North Eastern Marine Engineering Co., Limited, Wallsend, and working at 200 lbs. pressure. This vessel will be placed on the Admiralty list. The 'tween decks, which are exceptionally high, are pierced all fore and aft for the accommodation of troops or emigrants. Special attention has been paid to the ventilation of passengers' accommodation throughout the vessel. The main engines are by Messrs. Wigham Richardson & Co., of Walker-on-Tyne, and are of Schlick & Tweedy's patent balance type of quadruple expansion engines, with four crank cylinders 25½ in., 36½ in., 52 in., and 78 in. by 54 in. stroke, with bronze propeller. The boilers are three in number, single-ended, exclusive of auxiliary boiler, working at a pressure of 200 lbs., and are fitted with Howden's patent forced draught. During the trial the whole of the machinery worked with the greatest satisfaction, and a mean speed of 13½ knots was obtained over the measured mile, which was considered most satisfactory, the vessel proceeding direct to London to complete loading, 2,000 tons of bunker coals having been already shipped in Sunderland. During construction the hull has been built under the constant inspection of Captain Ilbery, and has sailed under his command, whilst the engines have been supervised by Mr. A. Thomson, both of London. The vessel, when considered as a passenger and cargo steamer combined, is one of the largest and finest that has been built on the Wear.

Umvoti.—Last month the *Umvoti*, built by Mr. James Laing, Deptford Yard, on the Clyde, to the order of Messrs. Bullard, King & Co., of London and Natal, was taken on her trial trip. The engines are by Messrs. G. Clark, Limited, Southwick. At the trial the engines worked with great smoothness, a speed of 13½ knots being attained.

Canning.—Lately the large steel screw steamer *Canning* went down the river and ran her speed trials. She has been built to the order of Messrs. Lamport & Holt, Liverpool, and is the largest vessel owned by this firm, making the sixth steamer constructed for them within the past 18 months by Messrs. David and William Henderson & Co., Meadowside, Glasgow, and is a fine example of a first-class modern cargo carrier, having a deadweight capacity of fully 7,500 tons on a moderate draught. The dimensions of the *Canning* are 449 ft. by 52 ft. by 31½ ft., with a gross tonnage of about 5,366 tons, and her propelling machinery consists of a set of triple-expansion engines, with cylinders 29½ in., 47 in., and 78 in. diameter by 60 in. stroke, and three large double-ended boilers with Howden's forced draught. Hull and machinery are replete with all the latest improvements for the economical working of vessel and the prompt loading and discharging of cargo. On poop deck there is a specially designed steam winch arranged to work cargo, hatch, and stream anchor. Water ballast is carried in a cellular double bottom, and in fore and aft peaks. The bridge deck, covers cattlemen, petty officers' quarters, &c. Officers' and engineers' rooms are on top of bridge deck in houses alongside the engine casing, and are very large and thoroughly well ventilated to suit the tropics. Saloon and captain's room, &c., are in a house at fore end of bridge deck; the saloon is in polished hardwood of a neat design and tastefully upholstered. A teak chart and wheel-house is fitted on top of cabin deck-house. The seamen and firemen are berthed in the topgallant forecastle. A complete installation of electric light has been fitted throughout the vessel, including fixed lights in all holds and 'tween decks, and also cargo lamps for the hatches. 'Tween decks and holds are fitted with fire extinguishing pipes. The ship and machinery have been built to the highest class in Lloyd's registry. The machinery worked admirably throughout without any hitch. With 4,300 tons deadweight on board a speed of fully 14 knots was obtained. After the trial the vessel returned to Glasgow to complete loading for the West Coast of South America.

Holywell.—The s.s. *Holywell*, built by Messrs. Joseph L. Thompson & Sons, Limited, of the North Sands Shipbuilding Yard, to the order of the Tyzack and Branfoot Steam Shipping Co., Limited, has just proceeded on her first voyage, after having had a most successful trial trip. Her principal dimensions are:—350 ft. length between perpendiculars, 45 ft. beam, extreme, and 26 ft. 8 in. depth moulded. She has a deadweight carrying capacity of about 5,300 tons, which is equal to two and a half times her nett register tonnage. She is built on the spar-deck rules to Lloyd's highest class, and is specially constructed for the American trade. She is built on the cellular double bottom and longitudinal intercostal principle, and has six watertight bulkheads and iron longitudinal bulkheads right fore and aft. The vessel is fitted with the latest and most approved deck machinery, and every arrangement has been made for the rapid handling of American cargoes. The vessel attained the speed of 13·33 knots on the mile trial, the engines having developed about 1,400 I.H.P., with all water ballast and over a thousand tons of bunkers on board. This was considered a most satisfactory performance by the owners' representatives, and after the usual toasts had been duly honoured in the saloon the vessel proceeded to Galveston.

Lobelia.—The trial trip of the new steam trawler *Lobelia*, of Grimsby, which is the eleventh vessel built to the order of the North-Eastern Steam Fishing Co., Limited, Grimsby, by Messrs Cochrane & Cooper, of Beverley, and engined by Messrs. C. D. Holmes & Co., has taken place lately. The *Lobelia* has been fitted with engines of 40 N.H.P. The speed was tested between the lightships, proving her to be a good 9½-knot boat, the engines working without a hitch throughout.

Correspondence.

[*It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.*—ED. M. E.]

PISTON PACKING.

To the Editor of THE MARINE ENGINEER.

SIR,—Having just seen Mr. J. D. Stuart's remarks respecting my paper of last year, I wish to remove an opinion which he amongst others, appear to have formed *re* my remarks on Ramsbottom rings. I did not select them because I considered them the worst practice of the day, but because I considered them in the first rank of the day's piston packings. At the same time they are far from being all that may be desired. Their fitting, where worse have been in use, is undoubtedly attended with satisfaction. Having last month sent home my reply to the Institute of Marine Engineers to the "discussion" on the subject of my paper, some further views may be seen from the Institute's Transactions.

I am, Sir,
Yours truly,
WALTER WM. HOUFE.

Hong Kong,
August 18th, 1896.

SCREW PROPELLER DESIGNING.

To the Editor of THE MARINE ENGINEER.

SIR,—I have just seen an American book on screw propellers published by Mr. Chase. It is an excellent book, and if properly studied should be of great value to the engineer. There is, however, a sentence at the bottom of page 60 in that book, which I may be pardoned for publicly correcting Mr. Chase says: "It is very doubtful whether there will ever be devised a formula that can universally be applied to determine the best form and the most advantageous dimensions for a screw propeller under any given set of conditions." Mr. Chase is in error here; for I worked out such formulæ three years before Mr. Chase's book was published, and the fact was noted in the MARINE ENGINEER for September, 1892. There was no need to advertise it, inasmuch as the mere announcement brought me many requests to design propellers, which requests have continually increased. This sufficiently proves the usefulness of my system in saving coals and increasing speed I am not aware whether any announcement was made in the American papers, but I suppose not, or Mr. Chase would have heard of it.

Yours faithfully,
C. PURCELL TAYLOR.

2, Powis Place,
Queen's Square, W.C.
September 9th, 1896.

Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships, from August 7th to September 9th, 1896.

17378	W. H. Carney and E. G. Sevenoaks. Stoppers for boiler tubes.
17433	T. Feather. Armour plates for warships.
17436	T. Bassnet. Compasses.
17470	W. and A. Pilkington. Metallic tubes.
17481	J. Schmidt. Turbine wheels for steam turbines, &c.
17489	J. R. da Costa. Connecting boiler tubes.
17503	J. R da Costa. New multitubular boiler.
17509	E. H. Spencer. Journal boxes or bearings.
17512	W. F. Elston. Cowls for ventilating shafts.
17529	W. and F. Marsh. Centrifugal pumps.
17546	J. Liddle (W. Hardie, China). Steam boilers.
17549	F. A. Walton. Manufacture of tubing.
17559	W. McG. Greaves. Furnaces.
17570	J. Greenfield. Ships' propellers.
17575	H. Ramsay. Blocks for boat lowering gear.
17576	C. C. Cooper. Valve for engine governors.
17586	W. Ripper. Water gauge cocks.
17609	G. W. Brown. Apparatus for stopping engines.
17637	G. Hutchinson and T. H. and A. J. Lawson. Covering composition.
17663	H. F. Parshall. Maximum speed governors.
17684	P. Clibborn. Device for saving life at sea.
17686	A. Holmes. Landing nets.
17695	N. Maiewski. Rotary engines.
17700	B. Demont. Rotary engines.
17712	R. Sutcliffe. Life belt.
17728	A. W. Thierkoff. Pumps.
17732	R. L. Weighton and D. B. Morison. Engines.
17733	O. Meredith. Flues for steam boilers.
17735	J. Reagan. Shaking grates for marine boilers.
17769	G. C. Coate. Mountings of seats for boats.
17774	W. H. Sharp. Fire grates of furnaces.
17786	H. H. Lake (K. D. Dunlop, United States). Rotary steam engines.
17804	P. A. Newton (The Ingersoll - Sergeant Drill Co. United States). Valve gear.
17810	E. Pease. Speed indicator.
17817	H. Hyde. Combined throttle and stop valve.
17850	F. Henneböhle. Automatic stop safety valves.
17867	F. L. Martineau and W. A. Taylor. Securing cranks.
17874	E. M. T. Boddam. Combined shell and torpedo.
17948	J. H. Crompton. Apparatus for recording speed.
17950	W. and A. Pilkington. Metallic tube manufacture.
17957	E. H. Lewis. Packing.
17982	W. S. Gilmore. Wrenches.
18000	F. J. Sweeting. Boat disengaging apparatus.
18017	A. Brown. Sand suction dredgers.
18022	C. H. Berry and F. R. Putz. Water level gauges.
18062	W. Deighton. Steam generators.
18079	D. Metcalfe. Wrench.
18095	W. Norris. Injectors for steam generators.
18119	J. A. and S. Fletcher. Pressure gauge mountings.
18123	T. J. Mackay. Sea sounding machine.
18130	C. Boddy. Boilers.
18151	J. T. Stewart. Fittings of cattle ships.
18152	W. Phillips. Motors.
18154	J. L. Gordon. Steam generators.
18164	E. Paul. Heaters for steam boilers.
18168	C. Schwalme. Welding furnace with generator.
18170	A. M. Hart. Rapid adjustment of spanners.
18183	C. Lutz and F. L. Desaunay. Steam boilers.
18202	W. M. Huskisson. Rotary turbine engines.
18293	C. H. Berry and J. Snowdon, jun. Lubricating apparatus.
18304	S. S. Brombead (A. Niel, France), Duplex oil engine.
18328	S. Redfern. Accessible valve for steam.
18338	F. Politzer. Propelling device for boats.
18362	A. Newsome. Valve gear for steam engines.
18373	G. Azzeroni. Ships' propellers.
18378	W. King and R. J. Martinez. Sailing vessels.
18379	W. King and R. J. Martinez. Marine vessels.
18403	P. Guterman and W. J. Campbell. Life saving apparatus.
18409	A. Fred ikson. Device for cleaning ships.
18418	E C. W. Toenges. Setting for boilers, &c.

18436 G. O. Holloway. Weldless tube machinery.
18449 G. J. C. Parker. Motors.
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18801 S. S. Walker. Gas buoys and beacon lights.
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19051 T. Murphy. Furnaces for steam generators.
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19108 J. Fielding. Making metal tubes.
19124 W. O. A. Lowe, Boiler furnaces.
19137 A. Hot. Construction of ships.
19162 J. A. R. Rudge. Life-saving apparatus.
19214 J. Gore and D. Owen. Check valve.
19265 T. and J. Nimmo. Pumps.
19274 F. V. Dalton. Showing depth of water.
19294 A. J. Cooper and E. E. Wigzell. Ships' logs.
19324 F. G. Evans. Indicating depth of water.
19357 A. W. Bird. Raft for saving life at sea.
19358 W. Rockliffe. Beam for use in shipbuilding.
19384 W. Malam. Flanged tube manufacture.
19402 G. Opitz. Supplying fuel to furnaces.
19427 R. P. Asbridge. Propellers.
19443 E. Lagosse. Boilers.
19464 E. N. Mason. Water-tube steam boiler.
19467 A. G. Bessemer, jun. Torpedo mechanism.
19478 T. A. Hughes. Making rowlocks.
19490 J. S. Calkins. Exhaust steam water heater.
19493 J. H. Mayston. Burner for side lights for sailing vessels.
19512 J. Grubinski. Tubular boilers and heaters.
19535 J. S. Wood. Steam engine ellipitical principal.
19538 J. Hill. Furnaces.
19549 T. Rounthwaite. Steam generators.
19560 A. J. Taylor and W. Flint. Water pump.
19561 T. F. Irwin, J. J. Atkinson, and J. D. Young. Feed-water heaters.
19598 W. H. Watkinson. Condensing steam.
19620 J. G. Engels. Cleansing ships' bottoms.
19623 M. H. C. and H. E. C. Shann. Bending ship frames.
19634 J. Pottinger. Sounding the depth of water.
19658 G. Cockburn. Pressure-reducing valves.
19667 W. Whittaker. Mechanical stokers.
19735 T. J. Haslam. Automatic marine governor.
19736 J. Bousquet. Adaption of water tubes.
19751 H. Field. Closing, &c., bulkhead doors.
19789 J. L. Cotton. Ships' rudders.
19811 J. V. Bjorklind. Pipe wrenches.
19863 W. S. Simpson. Sliding seats for row boats.
19914 J. and H. McLaren. Steam engine governors.

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NOTE.—1C denotes First Class; 2C, Second Class.

August 29th, 1896.

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Bonnyman, J.	1C	Liverpool
Bruce, G.	1C	,,
Chubb, G. C. P.	2C	N.Shields
Cook, J. G.	2C	S'nd'land
Cowburn, W.	2C	Liverpool
Crosby, J. E.	1C	N.Shields
Foster, T.	2C	,,
Jones, A. T. H.	2C	Liverpool
Macauley, A. F.	2C	,,
Maccov, R. F.	1C	N.Shields
Main, T.	2C	S'nd'land
Modlin, G.G.	1C	London
Noble, A. J.	2C	,,
Norman, H. M.	2C	,,
Philip, H.	2C	S'nd'land
Pratt, M.	1C	Liverpool
Schmidt, C. T.	1C	London
Sharp, G. S.	2C	N.Shields
Thomson, H.	2C	,,
Thorne, W. L.	2C	,,
Walton, J.	1C	,,
Ward, R. A.	1C	S'nd'land

September 5th, 1896.

Anderson, W.	1C	Glasgow
Baker, C.	2C	Cardiff
Barr, J.	1C	Glasgow
Bignell, J. J.	1C	London
Bowie, A.	1C	Glasgow
Boyd, S.	2C	Belfast
Cairns, T. G.	1C	,,
Charles, A.	1C	Cardiff
Cooke, O.	1C	,,
Denholm, J.	1C	Glasgow
Donaldson, J.	2C	Liverpool
Duffey, J.	2C	,,
Dunlop, R.	1C	Glasgow
Fairley, S.	1C	,,
Gee, C. E.	1C	Cardiff
Greves, J. L.	1C	N.Shields
Harley, A. A.	1C	London
Harris, J.	1C	Glasgow
Hicke, F. G. LeC	2C	Cardiff
Hudson, H.	2C	London
Lowden, D.	1C	Glasgow
Mackie, H. J.	2C	,,
McCririck, R.	1C	Liverpool
McIver, C.	1C	Glasgow
Milne, W.	1C	,,
Moffat, J. C.	2C	Belfast
Molley, E. P.	2C	Liverpool
Pearn, W. G.	1C	Cardiff
Randall, J.	2C	Cork
Robson, S.	1C	N.Shields
Smart, J.	2C	Liverpool
Spark, A.	1C	N.Shields
Stanway, J. T.	2C	Liverpool
Warden, J.	2C	Glasgow

September 12th, 1896.

Bailie, H.	2C	Dublin
Bird, R. J.	2C	N.Shields
Bowes, G.	2C	Glasgow
Cairns, John	2C	Liverpool
Cargill, J. F.	1C	Leith
Crichton, J.	1C	Glasgow
Drummond, D.	1C	Greenock
Falconer, J.	1C	,,
Fenwick, C. M.	2C	N.Shields
Fotheringham, J.	2C	Green'ck
Galbraith, P.J.H.	1C	Liverpool
Galltly, J. C.	2C	Glasgow
Gillespie, W. B.	1C	Greenock
Goodfellow, A.	1C	Glasgow
Hay, J. G.	2C	Leith
Heeley, Ewert T.	1C	Liverpool
Hicks, E. J.	2C	N.Shields
Hill, H.	2C	London
Hope, J.	2C	Glasgow
Keith, D. D.	2C	Dundee
Jerrat, A. B.	2C	Greenock
Johnson, W.	1C	Dublin
Laird, A.	1C	Greenock
Leach, W. A. C.	1C	,,
Le Cern, W. J.	2C	London
McCullough, W.	1C	Dublin
McJerrow, T.	1C	Glasgow
Mc Kay, G. H.	2C	Greenock
Monk, Oliver	1C	Liverpool
Murphy, M. R.	1C	Greenock
Newton, T. H.	1C	N.Shields
North, Philip	2C	Liverpool
Paterson, J. M.	2C	Glasgow
Rynsaard, J. W.	1C	N.Shields
Shanks, J. K.	1C	Glasgow
Smith, D. M.	1C	Leith
Stead, Harold	1C	Liverpool
Taylor, F. G.	1C	Greenock
Vander-Beh, R.	2C	N.Shields
Walpole, H. R.	2C	London
Watson, W.	2C	Dublin

September 19th, 1896.

Auld, Andrew	1C	Cork
Barbour, P.	2C	London
Brown, T. G. H.	2C	Cardiff
Clode, E. J.	2C	,,
Crabb, Joseph W.	1C	Liverpool
Crallan, J. T.	1C	W.H'pool
Flatters, E. A.	1C	Hull
Gallon, E.	2C	N'Shields
Harris, J. W.	2C	W.H'pool
Hodkin, John W.	1C	Liverpool
James, J.	2C	Cardiff
Jones, A. G.	2C	,,
Lyth, J. E.	2C	,,
Mackenzie, H.	1C	,,
Mc Kinlay, John	1C	Liverpool
Meikle, G.	1C	London
Metcalf, H. C.	2C	W.H'pool
Nance, J. W.	2C	,,
Palmer, A.	1C	Bristol
Rodger, A.	2C	London
Rogers, J.	1C	Cardiff
Rowland, W. O.	1C	Bristol
Seddon, W.	2C	Cardiff
Shaw, A.	2C	W.H'pool
Simpson, A. B.	2C	,,
Snowball, F.	1C	,,
Stonehouse, G.P.	1C	,,
Teverson, C. E.	2C	Cardiff
Thomson, T. T.	1C	N.Shields
Vaughan, J. E.	2C	Cardiff
Veal, W.	1C	London
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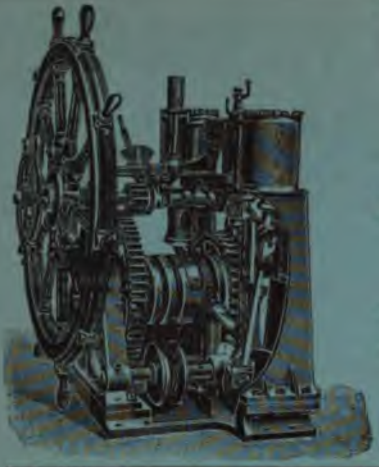

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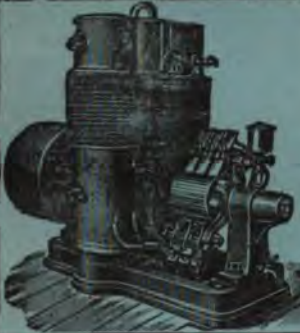

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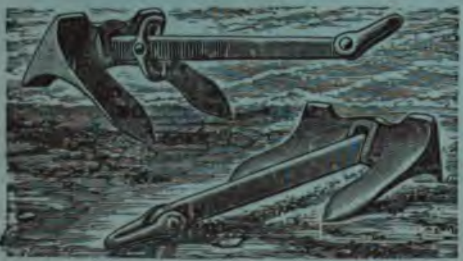

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The Marine Engineer.

LONDON, NOVEMBER 1, 1896.

AMONG the more noteworthy and more appreciable improvements which have been made in recent years for sea and ocean voyages, is the far better, and at present, the very superior accommodation of small passenger steamers. This is highly commendable, and especially as regards the mail and other ships of this class which ply to and from the Continent, Ireland, the Isle of Man and the Channel Islands. Their excellent qualities have been noticed by the Admiralty with the view to their use during warfare, in consequence of their high speed. About ten years ago, the rate at which they could be propelled was slow compared with—but few exceptions—the speed at which they can now be, and are driven. So much, however, has theirs peed increased during this interval, that at the present time many more of these small ships can be run at 20 knots an hour and upwards than all the ocean steamers afloat. The number of the latter, built and building, which have this high speed are only about nine, viz.: the *Campania* and *Lucania*, of the Cunard Line, 21½ knots; the *St. Louis* and *St. Paul*, of the American Line, 20½ knots; the *Paris* and *New York*, of the same line; the *Majestic* and *Teutonic* of the White Star Line, and the *Fürst Bismarck* of the Hamburg-American Line, 20 knots. Now the small steamers referred to which have 20 knots speed and upwards number about eighteen, and include the *Ireland* of the City of Dublin Steam Packet Co., the *Banshee* of the London and North-Western Railway Co., the *Ibex* of the Great Western Railway Co., the *Seine*, *Tamise* and *Sussex* of the London, Brighton and South Coast Railway Co.; the *Leopold II.*, *Marie Henrietta*, *Princess Henrietta* and *Princess Josephine*, the property of the Belgian Government; the *Koningen Regentes*, *Koningen Wilhelmina* and *Prins Hendrik*, belonging to the Zeeland Steamship Co.; the *Queen Victoria* and *Prince of Wales*, of the Isle of Man Steam Packet Co.; and *La Marguerite* and *Royal Sovereign*, owned by the Fairfield Shipbuilding and Engineering Co. There are also about twenty more of these small steamers of about 19 knots. Some of these, as well as others of this type of a higher speed, have been propelled on their ordinary voyages at rates considerably in excess of their stipulated speed when racing with their rivals. Excellent as are the above-mentioned short passage boats in respect of their swiftness, the fastest of them will soon be excelled in the rate of propulsion. The first of the four new steamers for the Irish mail service between Holyhead and Dublin to be constructed for the City of Dublin Steam Packet Co. by Messrs. Laird, was launched on the 27th of June, and the second on the 12th of September; the remaining two will be launched in a few weeks hence. All these ships will be provided with a minimum speed of 23 knots, so as to reduce the sea passage perhaps by half an hour, according to the terms of the contract with the Post Office. This record-breaking arranged speed for small passenger boats will probably in the near future induce the owners of other very fast steamers of this kind, and particularly of those crossing the Channel, to even eclipse these Irish sea-boats in rapid running. The great additional speed at which several British and foreign torpedo-boat destroyers have been run, and the original proposal to provide the four new steamers to be put on the route between Holyhead and Dublin, with a speed of 27 knots, which is four more than any naval cruiser built or building; will probably operate as a further inducement for owners of small passenger steamers to soon increase their speed beyond 23 knots. The benefit and advantage of the very high speed of these ships to travellers, and for the transport of mails and small goods, are immense and incalculable, and the more the speed of such increases, the more appreciable will the railway train service in connection with them become both as regards acceleration and other accommodation to passengers. It has been suggested, for example, that the London and North Western Railway Co. shall run express trains from Euston to Holyhead and *vice versa*, without stopping *en route* for the conveyance of mails and passengers to and from Holyhead, carried by the forthcoming new steamers to be ran between that port and Kingstown. This railway journey, it is declared, could be thus performed without difficulty, having regard to the fact that the company recently ran an experimental train from Euston to Carlisle, a distance of about 300 miles, without stopping between these places. In consequence also of the high speed of the steamers to the Channel Islands, not only have daylight trips from Weymouth thereto been run by the Great Western Railway Co. in the summer in connection with the arrival of trains from Paddington Station at this watering-place, and which trains did not start early in the morning; but it has been urged that a mid-day postal despatch could and should be made from Jersey by the steamers of the London and South Western Railway Co. to Southampton, as these boats have a speed of 19½ knots, so that mails from that island and Guernsey should be delivered in London and other districts in England by the first post on the following morning. It is probable that this arrangement will soon be made by the payment of a reasonable sum for such service by the Postal authorities. From time to time also increased acceleration has been made in English and Continental express train service in connection with the additional speed of cross-channel steamers during the last seven years, and this accommodation is likely to be soon further enhanced. If Milford should become a port of call for Transatlantic liners, the Great Western Railway Co. will probably find it to their advantage to have a new service of fast steamers between that place and Waterford in lieu of the slow boats which now cross on this route. In the near future too, a faster service of steamers may be expected to run between Fleetwood and Belfast, and also between Barrow and Belfast, and accelerated trains in connection with them. With regard to other means of comfort and accommodation afforded to passengers on the better class of short passage steamers besides high speed, these appear to be all that can properly be required, and especially as to first saloons, state-rooms, ladies' rooms, smoking rooms and promenade decks. The progress which has recently been made in these improvements and luxurious arrangements has been very great, and far better than the most hopeful voyagers could have imagined five years ago. From the forgoing statements it is much to be regretted that the Press has not pointed out the merits of the better kind of these small steamers, and the probable increase within a few years of their accommodation and utility as regards speed, and the acceleration of trains in connection with them to anything like the extent it should have done according to reasonable requirements.

We are not surprised that the Institute of Marine Engineers are far from satisfied with the new regulations proposed by the Board of Trade for second-class certificates for marine engineers. A great deal of correspondence has been undertaken by the Board of Trade to ascertain the views of marine engineers and shipowners as to the amount and nature of the qualifications in practical experience necessary for candidates for second-class certificates, and, as a result, an almost unanimous expression of opinion has been elicited that a candidate, to be qualified for a second-class certificate, should have served an apprenticeship of five years in engineering works. The Board of Trade, whilst appearing to concede to these views, has worded the regulations in sucha way that a man who has spent his five years in boring holes in a ship's hull, or as a moulder or boiler-maker in a marine engineer's shop or in a shipyard would be qualified as to practical knowledge. The words of paragraph A of the new regulations put it that "He must have been employed for at least five years as an artizan on work of a description required in the construction of the engines, boilers or hulls or machinery of steamships." This may evidently cover any class of labour in a shipyard or marine engineer's shop, or in a jobbing shop, so long as it is making any detail of machinery, such as winches employed on board ship, but apparently excludes a skilled engineer who has been trained say as an apprentice in locomotive or millwrighting or land engine shops. The Institute of Marine Engineers had naturally a very energetic discussion at their meeting last month upon these proposed new regulations, and the opinions of all present forcibly expressed that the terms of the regulations entirely annulled the improvement in the qualifications and consequent status of the certificated engineer. We do not know whether the object of the Board of Trade is to leave the door open to any inexperienced and half-trained man who can pass the written examination, but it would appear so, unless they have not understood the proper definition for a trained practical engineer in such branches of general mechanical engineering as are usually accepted as embraced by the term. We understand the Institute at an adjourned meeting is again about to pass resolutions upon suitable forms of the regulations, and we hope the Board of Trade will reconsider the matter. There would appear also to be a consensus of opinion that one certificated engineer should be carried by all steamers above 50 N.H.P., and that many vessels of even 2,000 tons burden evade the obligation to carry two certificated engineers by declaring themselves under 100 N.H.P.

We have before us the report of the twelfth annual meeting of the North-East Coast Institution of Engineers and Shipbuilders, and we are glad to see that although the Institution has financially suffered, we suppose from general depression in trade, it can still show a balance on the right side on the annual statement. The Institution has carried out an important work of public benefit in setting out new measured mile-posts, and officially certifying to their correctness, and the cost of this valuable undertaking has, we are glad to see, been borne by voluntary subscriptions from the various shipbuilding and engineering firms in the district. The new President, Col. Henry F. Swan, delivered the usual inaugural address, which was devoted to an interesting historical summary of the rapid growth of iron shipbuilding on the Tyne, Wear, Tees and Humber, and at Hartlepool, Whitby and Blyth, representing the North-East district. These results are represented both severally and collectively, and also in comparison with the building on the Clyde in a very plain and interesting diagram, which diagram shows most conclusively the regular successive fluctuations, between minimum and maximum productions, at cycle intervals of about nine years, from maximum to maximum, and with a general gross increase throughout the thirty years tabulated in the diagram. The President also reviewed the general characteristics of the production of each of the various centres of the East-Coast district, giving the palm of greatest variety to the Tyne, owing to the speciality upon that river of the tug-boat trade. To the builders of Hartlepool he gives credit to their boldness and enterprise in the introduction of the well-deck vessel, which at first found little favour with the authorities, and was only after long experience recognised as eminently safe. To the Wear credit is given for the up-hill fight to introduce the turret steamer, which is now recognised as a satisfactory and very economical vessel. The introduction of "joggled" plating for the shells of vessels also hails from the same quarter, whereby packing ships for outside strakes are dispensed with, thus obtaining considerable saving in weight. The President also gave serious reference to the energetic competition of Germany in late years, which has built and is building many gigantic cargo vessels and Atlantic liners. The type of vessel built everywhere is now rapidly increasing as regards tonnage, and the weight and size of plates, beams and angles, necessitating improved and more powerful appliances to handle them, and many late improvements in this direction are claimed for Messrs. Swan & Hunter.

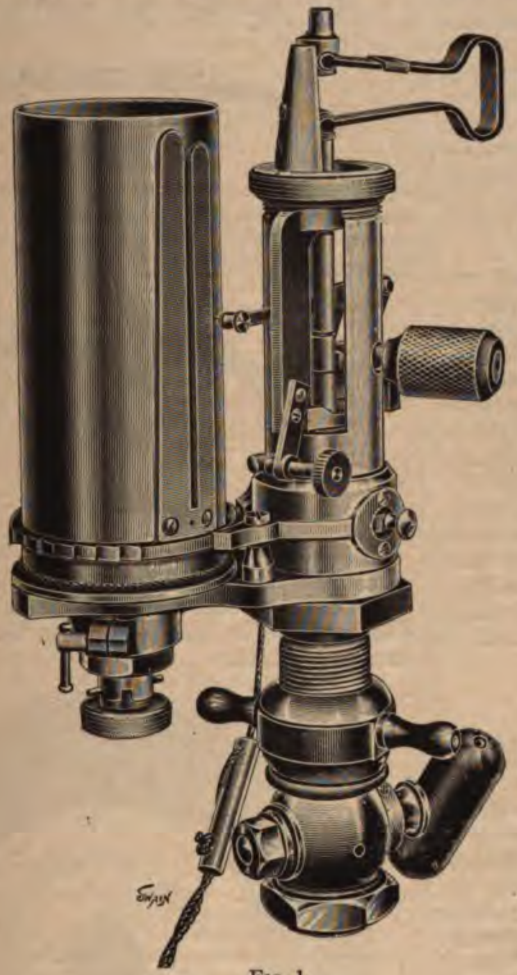


Fig. 1.

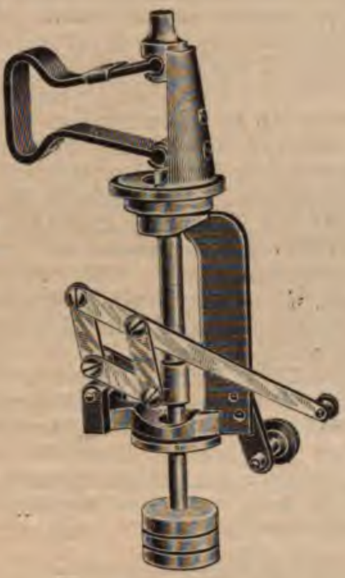


Fig. 2

THE SIMPLEX PATENT INDICATOR.

An indicator containing some novel departures from the ordinary pattern has been placed on the market by the well-known scientific instrument makers, Messrs. Elliott Brothers, of 101, St. Martin's Lane, London, W.C. The features sought to be embodied in the design were, we understand, lightness and the balance of the moving parts consistent with proper strength; and further, the reduction of friction to a minimum. We have pleasure in illustrating this new indicator, which is termed the "Simplex," in the adjoining diagrams, Fig. 1 being a perspective view of the complete instrument, and Fig. 2 being a similar view of the piston, parallel motion, spring, and the supports for same detached from the main portion of the instrument.

The first novelty that will strike the eye is the substitution of a "Tongs"-shaped spring for the usual spiral spring. This spring is arranged outside and away from the steam cylinder, and thus its accuracy is maintained to a higher degree, as it is not subject to extremes of temperature or the corrosive action of saturated steam. We understand that the particular shape of the spring allows of it being made very accurately with great certainty, and it is obvious that by its arrangement on the instrument it can be more easily changed than the ordinary pattern.

The control spring for the paper drum is arranged so as to be very easily adjusted to varying tensions, and a detent gear is fitted to the paper drum, by which the drum can be thrown in and out of action for convenience when putting on fresh paper and changing the indicator spring. It will be noticed that the moving parts are very light, and that a handle is provided by which the indicator can be held while hot.

Another advantage is the facility by which the whole of the piston and parallel motion and piston-rod can be removed in a few seconds by simply undoing the milled nut at the top of the instrument, and drawing out the complete mechanical element as illustrated very clearly in Fig. 2. The indicators are made in two sizes, viz:— a large size giving diagrams 3 in. in height, for use at speeds up to 250 revolutions, and a small size giving diagrams 1½ in. in height, for use at speeds from 250 to 500 revolutions per minute.

We think the novel feature of the spring, which we understand is more easily calibrated, and is more uniform in range of pressure than the ordinary vertical spring, should appeal to the common-sense of all engineers who have to place a great deal of confidence in indicator diagrams.

THE "LANCASTER" WAVE SPRING PISTON.

We understand that the "Lancaster" wave spring pistons have been working in cylinders up to 112 in. diameter, both oscillating and fixed, for upwards of four years, and have given great satisfaction. We illustrate in the adjoining diagrams the springs and a piston fitted with the springs. The manufacturers start with the hypothesis that the old "coach" or C spring needs continuous setting up or adjusting, and owing to its want of elasticity it presses the rings too tightly against the cylinder when set up, and in a very short time will pass steam to a considerable extent, very often at a time when it is impossible to open the cylinders out, and their object in designing the wave spring was to overcome these disadvantages. As shown in Fig. 1, it will be seen that the wave spring is in outline similar to the "coach" spring, but instead of being merely a flat plate or plates of steel, is made of round wire bent into a wave form. The springs are fitted between projections formed on the piston back as when coach springs are used, and Fig. 2 shows the spring in position between same without piston ring. The dotted lines show the form it assumes when the ring is in position. The difference in height shows the amount to which the spring will follow the ring up as it wears. Fig. 3 shows a piston with springs fitted. The upper half shows the ring when new, and the lower half shows the ring partially worn, illustrating the manner in which the springs follow up the wear of the rings.

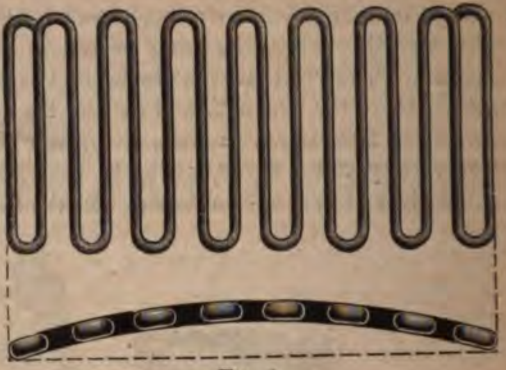


Fig. 1.

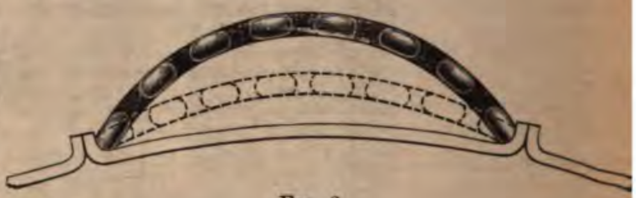
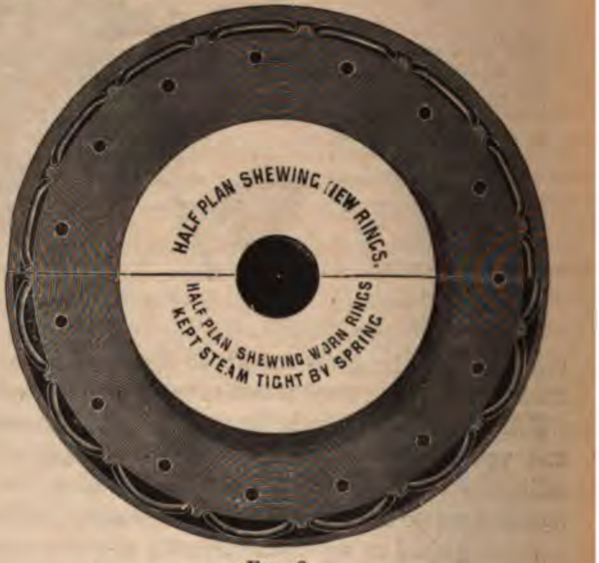


Fig. 2.

It is claimed that this arrangement is perfectly self-adjusting, it will remain steam-tight till the rings are worn out, and only sufficient pressure is exerted by the springs to keep the rings steam-tight without excessive friction.


HALF PLAN SHEWING NEW RINGS.
HALF PLAN SHEWING WORN RINGS KEPT STEAM TIGHT BY SPRING
Fig. 3.

These pistons, or the rings and springs for same, are manufactured by Messrs. Lancaster & Tonge, Limited, engineers, Pendleton, Manchester.

THE FLEETS OF THE MAIL LINES.

(*From our own Correspondent.*)

The Spanish Transatlantic Company

Was not satisfied even with the large batch of additions mentioned in my last instalment of these Notes. They have acquired—whether by purchase or merely on charter, I am not yet sure—the once famous *Alaska*, for the purpose of carrying further troops to Cuba. Whether she be saying farewell to the British flag altogether or not, we may pretty certainly presume that the Liverpool and New York mail trade will see her no more. It is necessary therefore to regard her history in the trade which for some years she dominated. As most readers are probably aware, she was built in the Fairfield yard, and was the second of the record breakers built there, though she was the first to acquire the *Sobriquet* of the Atlantic Greyhound—a name which has since been generally used to describe the whole class of fast mail boats. She was built at the time when most of the New York lines felt it to their interest to build something finer, larger and faster than anything they had yet attempted. Thus Cunards topped the *Gallia* with the *Servia*, building her of steel, whilst Inman's built that unfortunate craft the *City of Rome*, which was quickly transferred to another line; the North-German Lloyd had the *Elbe*, first of their fleet of modern express steamers, and Guion's had the *Alaska*. These vessels were all iron. The Guion Line had two years previously brought out the *Arizona*, and found that speed brought passengers, and they determined that the record they had attained with her should not be lowered, save by a vessel bearing their own flag. In this desire they were not frustrated, for the *City of Rome* never had speed, certainly not at the beginning of her career, and the *Servia* was not equal to the *Alaska*. This vessel was just 50 ft. longer and 5 ft. broader than her prdecessor, and was the first of the Fairfield fliers to attain the length of 500 ft, a length which has been given to at least four subsequent greyhounds and one which Fairfield only discarded when at a single bound they sprang to 600 ft., adding another 20 ft. per cent. to the keels of the *Campania* and *Lucania*. The *Alaska* had no proper trial, and was thus unique, as far as I am aware, amongst the Fairfield sisterhood. It is said that when she got round to Liverpool the work on her boilers was not yet complete. This was at the end of October, 1881, and she left Liverpool on her maiden trip on the last day of that month. Before the end of the year she had made two round trips, but had not yet evinced any very remarkable speed. On her maiden trip she had certainly done over 400 nautical miles in a day's steaming. But this was not better than her White Star predecessors had done and she had fully twice their power. But on the completion of her second voyage she took a winter's rest, and certain improvements were effected which at once began to show their effect on her pace. She took the homeward record from the *Arizona* that very trip. The outward followed on the next. Then she went on improving her own time till she brought the time of crossing for the first time in history, to under seven days, in 1883. By the end of that season she had got the outward time to under 6 days, 22 hours. This performance she never bettered, and soon afterwards her younger sister, the *Oregon*, superseded her in the premier place, which of course she continued to hold after her transfer to Cunard's finally deprived the Guion Line of the blue riband of the Atlantic. The *Alaska*, of course, has compound engines of the three-crank type, and her best speed for a whole voyage was about 18½ knots. Of late years this speed has not been maintained, and her average time of crossing very much increased. In 1885 befell what was the most serious accident she sustained. On a westward voyage she encountered very heavy weather and lost her rudder. As, of course, she is only a single-screw ship, she was totally disabled by this accident. Fortunately a Beaver liner came along and was big enough to render her adequate assistance. The *Alaska*, whose engines were fortunately all right, took her salvor in tow and with this assistance steamed into New York, having been altogether just over a fortnight out from Queenstown.

At the end of 1893 she spent a winter at New York owing to a defect which was found in her crank shaft. The following year she only made one round trip, and since then has had a two years' holiday till she was taken to the Fairfield yard at the beginning of October to be fitted out for her new service. As vessels go she is young in the Atlantic trade, and the number of voyages she has made is comparatively small. She has not completed her first century of round voyages, whilst the *Servia*, of her own age, now gone into reserve, has crossed about 70 times oftener. Even the comparatively modern *New York* has done as much service as has the *Alaska*.

A Breakdown.

Speaking of the *New York* and the great amount of work she has crammed into her comparatively brief existence, reminds me of her sister the *Paris* and her troubles. She has of late been an unlucky ship. There were several minor defects which from time to time have taken her to Cramp's yard and to Newport News. Now bound east she has had an accident which forcibly reminds one of the disaster which befell her in early days, and which very nearly sent her to the bottom of the Atlantic. In that case it will be remembered she broke her shaft, and the consequent racing of the engines wrecked her engine-room, disabled both sets of engines, and holed her hull. Fortunately in the present case, thanks to improved governors, there was no injury to the engines, and she was able to proceed with her voyage, and make port without taking assistance. It is a creditable thing for all concerned that she did proceed with a single screw, and practically did the whole crossing in her partially disabled condition. I am a little surprised, however, that her speed was only an average of about 12 knots. One would have imagined that the deprivation of half her power would certainly not have cut her down below 15 knots. The fracture in the shafting was again in the external part, and we are once more reminded of the wisdom of the plan adopted in the British liners of the White Star and Cunard lines, whereby there is no external shafting. To my mind it is a serious reflection that when the Mercantile Marine is finding out the inadvisability of carrying shafts on external brackets, and even the later American liners have discarded the plan, our Navy cleaves to the old system. They would be certain to find out the danger of the system by repeated breakdowns if they ever had occasion to maintain a high speed for any length of time. That is, if our warships were worked under war conditions. The only satisfaction I have on this point is the reflection that if our Navy is wrong in this regard it errs in company with those of all foreign Powers. The injuries to the *Paris* seem to be more serious than was at first believed. The *Berlin* was, of course, brought into harness again to take her sailing westwards, as the *New York* was being overhauled on the other side. But the *Paris* was at first advertised to sail again from Southampton on the 31st October. Another vessel is, however, substituted for her, the *New York* comes back to the mill, and the *Paris* is not put forward at all for the next few weeks.

The Castle Line

is said to have ordered another mail steamer since we last referred to the fleet. She will be a vessel of the length of the *Alaska*, and, of course, something very much greater than even the *Dunvegan Castle*, as yet the biggest of the Donald Currie boats.

The North-German Lloyd Company

is evidently about to make things hum in the Australian trade. I have received an account of the first of the new fleet they are turning out for that branch of their services. These ships are of a tonnage far greater than anything yet seen in Australian waters. Even the Shaw-Savill and Albion Company's twin-screw steamer *Gothic* is dwarfed by the 10,500 tons of the new-comers. They are, of course, also twin-screw boats. Equally, of course, they are made in Germany, for it seems certain that the Emperor has forbidden his subsidised lines to go to British yards in future. There are four vessels in course of construction for this Australian service—two of them at the Vulcan yard, one at Herr Schichau's, and one at the yard of Herren, Blohm & Voss. The Vulcan Company has already put one of its boats into the water. This vessel bears the name of the *Freidrich der Grosse*. She is remarkable in another way than for her mere size. She is the first vessel, so far as I am aware, to have a third deck above her spar-deck. Thirty years ago even the spar-deck was regarded as somewhat of an innovation. Such an old-fashioned vessel as the *Sarmatian*, of the Allan line, for example, has a few deck-houses on her spar-deck; but that is—or was when I crossed in the staunch old craft—the only deck on which any passengers of any class could promenade. Then came the *Oceanic* and her type, which put on a second tier of deck-houses and made a promenade deck above the spar-deck, leaving the sides of the spar-deck still free for movement. This style is still to be seen in the *Umbria* and *Etruria*, and innumerable other first-class vessels. The idea was developed differently, however, in some lines, who took the promenade deck idea, but built deck-houses outside the spar-deck, as in the North-German Lloyd express boats. Then came the idea, worked out first in the *Teutonic*, of putting a permanent awning deck above the promenade, so as to free the latter from rain and sun, and boats and navigation. This idea has not hitherto been improved on; but the new North-German boats have above the spar-deck their own arrangement of external deck-houses, with above that the White Star promenade deck with open sides, and above that the permanent awning deck. What a lot of fresh air this arrangement implies for the passenger in the tropics. Nearly everyone will be berthed on an upper deck, whilst the saloons will all be upstairs. The vessels will have some 12 bulkheads and 20 boats. Their engines are of the quadruple type, and the sea speed is to be something like 14 knots. It is needless to say that the ornamentation of the public rooms will be elaborate and well considered, nor that the sleeping accommodation will have great attention. These matters are attended to in all vessels of this line. Many of the first-class state-rooms will be for single passengers. If these ships really go to Australia, and be not diverted into the North Atlantic trade, there will certainly be warm times in the trade.

A Rescue.

There has been another instance of the gallantry of British merchant seamen in effecting rescues at sea. This time the injured ship was an American sailer, and the rescuer was the British steamer *Fifeshire*. The work was effected by boat service in a very heavy sea, and though the gallant object of the rescuers was effected, and that without loss of life, the sea was so heavy that the lifeboat in which the work was done had to be abandoned as the sea would not allow her to be hoisted on board again.

Deaths.

The month which has just passed has seen the death of two men who were largely connected with the development of steam navigation. They both passed away after careers extending beyond the usual span of human life. The first was Sir Edward Bates, for many years member of Parliament for Plymouth, where comparatively recently in his business career he had established a sugar refinery. Though he was not himself an owner of mail steamers, many very famous mail steamers passed through his hands as sailing ships in his early days, when they had run their course as fast Atlantic liners. He was the subject of a very unwarrantable personal attack many years ago by Mr. Plimsoll in the House of Commons.

The other was Sir James Ramsden, the maker of Barrow. He began life as a railway man. But as time went on he was concerned with many other industries, including ironworks, shipbuilding, and dock construction. He found Barrow an insignificant hamlet. He left it a prosperous city with manufactures, arsenals, and docks of a class to be found only in the great seaports of the world, and that only of recent years. His memory will be kept green by the statue which those he benefited erected to him in the town of Barrow, and also by the fact that one of the great docks of that port bears his name.

La Compagnie Generale Transatlantique

is quietly extending its work. It is now starting in the trade between the West Indies and New York, and will thus seriously interfere, at least for a time, with the British Atlas Line. There is also a rumour that it is about to commence a service from Philadelphia—which it has not hitherto attacked—to the Mediteranean.

A Social Gathering

of a new kind was inaugurated, on the 22nd of October, by Mr. T. H. Ismay, the founder of the White Star Line. There are from time to time conferences of those who are engaged in Transatlantic passenger trade. These, however, have been of the most commercial kind, and those who have been present have been very careful to keep the rest of the company well at arm's length. Mr. Ismay has induced his competitors to meet him at dinner, and on the date I mention he entertained them at the Reform Club in London. Of course, the initiative step could only have been taken by a leader of men, but now that the ice has been broken and these keen rivals have met at the social board, we may hope that good results to themselves and the public will follow, and that these meetings under non-commercial conditions will become a regular institution.

The Union Line

has lost a devoted servant in Captain Jones, of the s.s. *Norman*. He was obliged to remain on shore the last time his ship sailed to the southward, as he was suffering from a serious complaint. But it was hoped that his retirement was but for a single voyage. This hope was unfortunately doomed to disappointment. He was scarcely fifty years of age, and had commanded many well known vessels in their day. He is succeeded in his command by Captain Maloney, who was last in one of the "G's."

The new Union Mail boat which is to excel both the *Norman* and the *Scot*, is causing some little anxiety amongst the knowing ones as to the name she is to bear. A certain very young and somewhat self-assertive shipping paper declares that she is to be called the *Saxon*. A good old Union name it is. But there is more probability that she will be named *Briton*, as some other papers suggest. They, however, are not quite accurate, for they write it *Breton*. Surely there can be no intention to call the new ship by a name which the company has never used when their most historical title, borne by two of their most famous ships of former days, is at liberty.

The Pacific Mail Lines

are about to be reinforced by another fine vessel. Messrs. Huddart's find that the *Miowera* and *Warrimoo* have built up such a reputation for their Canadian-Australian Line that another vessel is called for. They have accordingly secured one of the earlier of the New Zealand Shipping Company's vessels, the *Aorangi*, once, I think, the holder of the New Zealand record. They have sent her to the East Coast, where she is having new boilers, new engines and new accommodation, both for passengers and cargo—especially for cold cargo—and will in fact come on to her station as a practically new ship. Her advent will enable the line to call at a New Zealand port and so to carry the New Zealand as well as the Australian mails. All this tends to show how warm is the feeling of the colonists towards the Empire and towards one another and is a thing upon which we cannot congratulate ourselves too warmly.

A New Departure.

There is to be immediately commenced a new hotel at Capetown, a thing which is very much needed at that flourishing port. It is to be built and managed under the auspices of the indomitable Sir Donald Currie, though as a quite separate undertaking from his Castle Line of mail packets. That it will be a benefit both to travellers and to the line with which the name of Currie is peculiarly identified, we cannot doubt. I do not think that any steamship company has hitherto interested itself in the hotel business. Its work at sea in modern days has been so identical with hotel keeping that they have probably thought it not worth while to meddle with stationary inns. But experience has showed how greatly to the benefit of railway companies it is to have control of the hotels at their termini and channel quays, and no doubt the same experience will attend Sir Donald's latest venture.

An Amusing Account

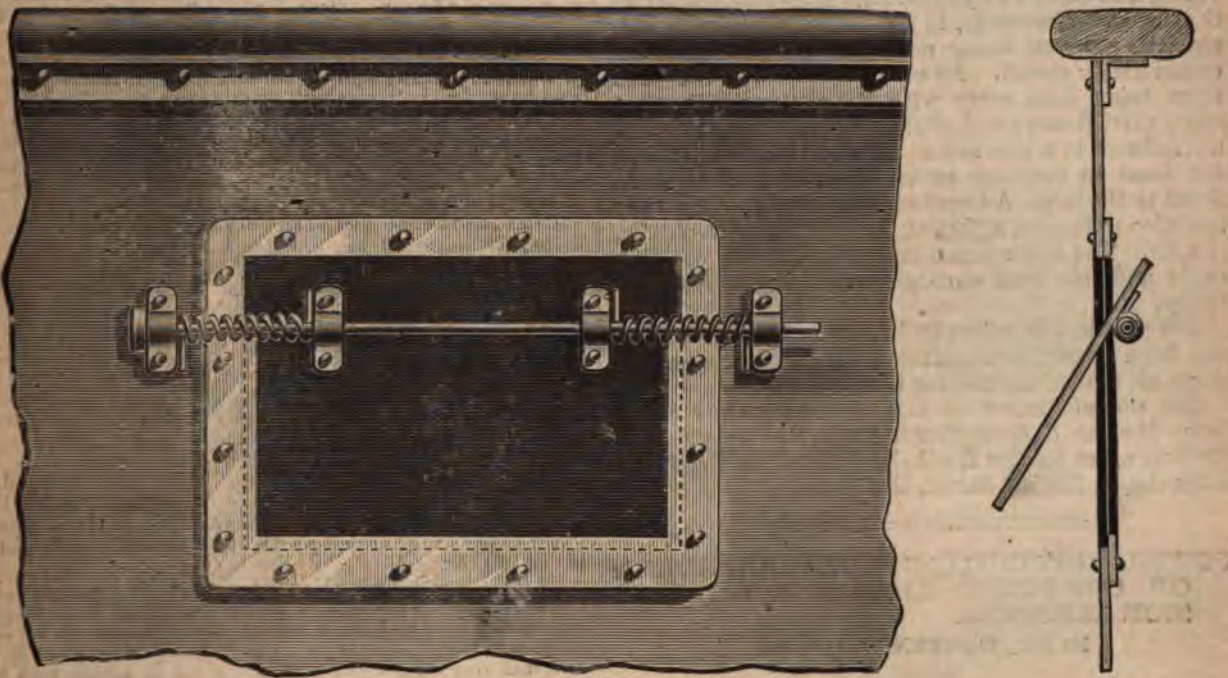
of the adventures of those on board the *Paris* on her recent overtime trip is just to hand. I mention it separately for I had already dealt with the matter, and said what I had to say about the accident. But the Southampton press deserves a wider publicity than their own columns give them for their remarks on the matter. They of course interviewed passengers. The ladies and gentlemen who volunteered for this ordeal seem to have been thoroughly American and very anxious to tell the reporter of their own eminence in their peculiar walks of life before saying anything about the trip. Truth to say that from the passengers' point of view, there was little to be said. But Captain Watkins was enabled to show how large a quantity of food is carried by an Atlantic Liner, and so to prove that, as regards supplies at least, there was no danger in going ahead. He was fortunate in having on board the managing director of the firm which owns the ship, and also the vessel's designer. So that if ever a captain was able to divest himself of the responsibility of pressing ahead instead of putting back he was in a position to do so. Still it was a very plucky thing to do and he deserves all credit for it. He is credited with the use of the word "larboard" in the report of his interview. But he is not a nautical Rip Van Winkle, who has been asleep all the years that sailors have called the left hand "port." The context shows that "larboard" was the reporter's reading of "starboard."

Steamship Amalgamation

appears to be the order of the day. That of Wilson's, Furness & Leyland has already been referred to, and the new combination has already got a new ship, and had her put into the water, by Messrs. Wm. Gray & Co., being the largest vessel yet built at the Hartlepools. Their union has been followed by a great coal trade combination. This has a capital of two millions sterling, and swallows up the English business of eight firms of very well-known repute. The new company, under the name of William Cory & Co., Limited, becomes possessor of many things, and amongst others of the very large number of barges, steam tugs, and large sea-going colliers.

The late Sir Edward Harland.

The will of the famous shipbuilder, Sir Edward Harland, Bart., M.P., for Belfast, has just been made public. He leaves a sum of £227,000 in personalty.



Lee & Morgan's Bulwark Port.

An American Purchase

Mention was made at the time of her coming out of the magnificent steam yacht *Giralda*, built by the Fairfield Shipbuilding Company in 1894 for Mr. H. McCalmont. She was large enough for an ocean mail boat; she had twin screws, and a speed of 20 knots, and was fitted in a way that made her a very useful auxiliary to our Navy in time of national crisis. Like too many of the other fast vessels of our Mercantile Marine, she has gone under a flag where her value as a possible commerce destroyer will be appreciated. She has been bought by an American millionaire, and has gone out through the Suez Canal to the Pacific Coast of America. It is, however, reported that her late owner is about to replace her.

The Japanese Mercantile Marine

has, during the month of October, been reinforced by a vessel which is worthy of more than passing consideration. This is the *Kasawagamaru*, launched by Messrs. D. & W. Henderson at Partick on the 22nd. She is a fast mail and passenger boat, and is the first of the great Japanese shipping company's vessels built for their trade to Europe. This would in itself make her a notable craft. But she is something more. She is a vessel suitable for the purpose for which the *Giralda* was a moment ago said to be fitted. She is adapted for military service in time of war. She is, in fact, very much on the lines of the vessels of the Russian Volunteer Fleet. And so Japan has joined the rapidly increasing ranks of countries who believe in the auxiliary cruiser and are acting upon their belief, whilst we who originated the idea, and first showed its value by sending an auxiliary cruiser to our manœuvres, have failed to develop it, and are doing all we can to discourage the addition of suitable vessels to our Mercantile Marine.

A Remarkable Experience

has fallen to the lot of the captain and crew of the Glasgow steamer *Linlithgow*. She was a vessel of some 3,300 tons gross. She was only two years old and left San Francisco for the United Kingdom on the last day of July. When about ten days out she broke her shaft and lost her propeller. A boat was sent away for assistance and duly reached the coast. On the 15th October, the remainder of those on board reached Guatemala in the other ship's boats, the vessel having been abandoned in a sinking state three days previously. Thus this steamer with a valuable cargo of grain—grain *is* valuable just at the moment—and a number of important lives on board was allowed to go drifting across the Pacific for two months without any attempt, so far as one can hear, being made to bring her into port. No doubt it was imagined that she could keep the sea for an indefinite period, as the underwriters only quoted her, at the time the news of her loss was received, at 30 guineas premium for re-insurances. But apparently her hull must have been damaged at the time she met with the accident to her machinery. This is certainly a case which needs explanation, and I very much hope that unless some very good explanation be afforded, the Board of Trade will make a searching inquiry into the circumstances and find out why these seamen and engineers were abandoned to their fate for all these long weeks when there are, or ought to be, British men-of-war on the Pacific station.

LEE & MORGAN'S BULWARK PORT.

A GOOD reliable bulwark port which will permit the escape of deck water, and at the same time protects the deck from the impact of external waves, is a *desideratum* for any vessel.

We have had lately brought under our notice a novelty in this line, which appears to answer the purpose named perfectly. This is Lee & Morgan's instantaneous self-closing water escape port. The great objections to the ordinary bulwark port are the constant flapping and banging that takes place when the ship is rolling, and its liability to admit water from the outside. The only practical use for bulwark ports is to free the decks from water coming over the bulwark or bow. The illustration clearly shows how this is accomplished, and in a very simple manner. Instead of hanging the port on the outside by means of hinges as in the ordinary way, this port is hung on the inside of the bulwark by means of a long bolt and four sockets. The self-closing action is effected by two spiral springs, made from a special brand of copper to prevent corrosion. By the action of the springs the port remains firmly closed during the rolling of the vessel, and can only open through pressure of water on the inside. The water, in a word, forces its way out, and the pressure being removed, the port again becomes firmly closed. All outside hinges, snecks and rings being done away with, the chances of the port being carried away and of other damage being inflicted are reduced to a minimum. These ports cost about the same as ordinary ports, and have recently been fitted to the large Australian liner the s.s. *Narrung* and also to the s.s. *Effective*, the s.s. *City of Rochester*, &c.,&c. The latter vessel is engaged in the coasting trade and has been through much stormy weather lately.

The port has therefore had a severe testing, and it has been amply demonstrated that it is capable of doing all that is claimed for it.

The manufacturers of this speciality are Messrs. John Morgan & Sons, South Dock, Sunderland, and the sole agent for the North-East Coast, is Mr. J. W. Donovan, 3, Norfolk Street, Sunderland.

POWER DISTRIBUTION IN THE CYLINDERS OF COMPOUND AND TRIPLE-EXPANSION ENGINES.

By MR. WALTER W. HOUFE.

(Continued.)

IN accordance with what has been said, the author proceeds to detail how to deal with indicator diagrams, in order to get at the "true" diagrams of the engines, and to inform us that, due to our being content to accept the diagrams as drawn by the indicator, engines are allowed to work with an overbalancing load on the high-pressure engine.

Mr. Henderson says his attention was forcibly drawn to the matter when designing "a cross-compound, direct-acting, pumping engine without a shaft," which was a case where absolute equality of power of the two cylinders was imperatively demanded. When coming to triple-expansion engines, he says a ready way to understand the working of such, is to conceive the three pistons superimposed upon one another, as shown in Figs. 3 and 4, and considered as one piston.

"Revised calculations for proportioning the cylinders of a compound," and of a triple engine, are given, but not here repeated. Mr. Henderson believes he is the first to point out that the loss from back pressure is reduced to one-half in a compound, and to one-third in a triple, of that encountered by a simple expansion engine of the same power.

As will be seen, the above article makes no attempt to prove its statements further than by several very loose analogies, and evidently all who accept its teachings either discredit, or throw to one side the principles of "mechanics," the only way which presents itself to disprove its statements to such is by simple experiment, which, if conducted in our imagination, may appeal to the understanding, or, if carried out materially, will force the acceptance of the truth as natural phenomena.

If a cylinder be placed horizontally, so as to reduce the discrepancies as much as possible, due to neglect of friction and other refinements, and be fitted with two pistons, which will divide the cylinder into three compartments, each of which is to be fitted with a pressure gauge, steam-admitting and exhaust arrangements; the pistons to have individual rods, working one through each end of the cylinder—(the pistons and their rods may here be considered perfectly rigid bodies)—outside which ends each rod is to be fastened to a fixed spring indicator, so that the magnitude of the load and its direction of each piston may be seen at any time. It is found that by admitting steam to the centre compartment, while the end gauges stand at 0 lbs., that both pistons tend outwards; and if the three gauges stand, say, at 0 lbs., 100 lbs. and 0 lbs. respectively, the load indicators will show loads of opposite direction, but both equal to 100 lbs. by area of piston. Thus the steam pressure acting on the pistons which are at the ends of this cylindrical column of steam is fully effective, and loads each piston with an outward load, which is "balanced" by the spring of the indicator at either end. Had the pistons been fixed to an ordinary through rod and these two pistons' loads been sustained by the cohesion of this length of rod between the two pistons, then would each load be separately "balanced" by this force which the particles of the rod are endowed with; for if the rod were severed the pistons would fly outward, owing to the loss of the "balancing" force to each exerted by the rod's particles. Thus it is wrong, strictly speaking, and misleading to here speak of the one piston's load "balancing" the other piston's load.

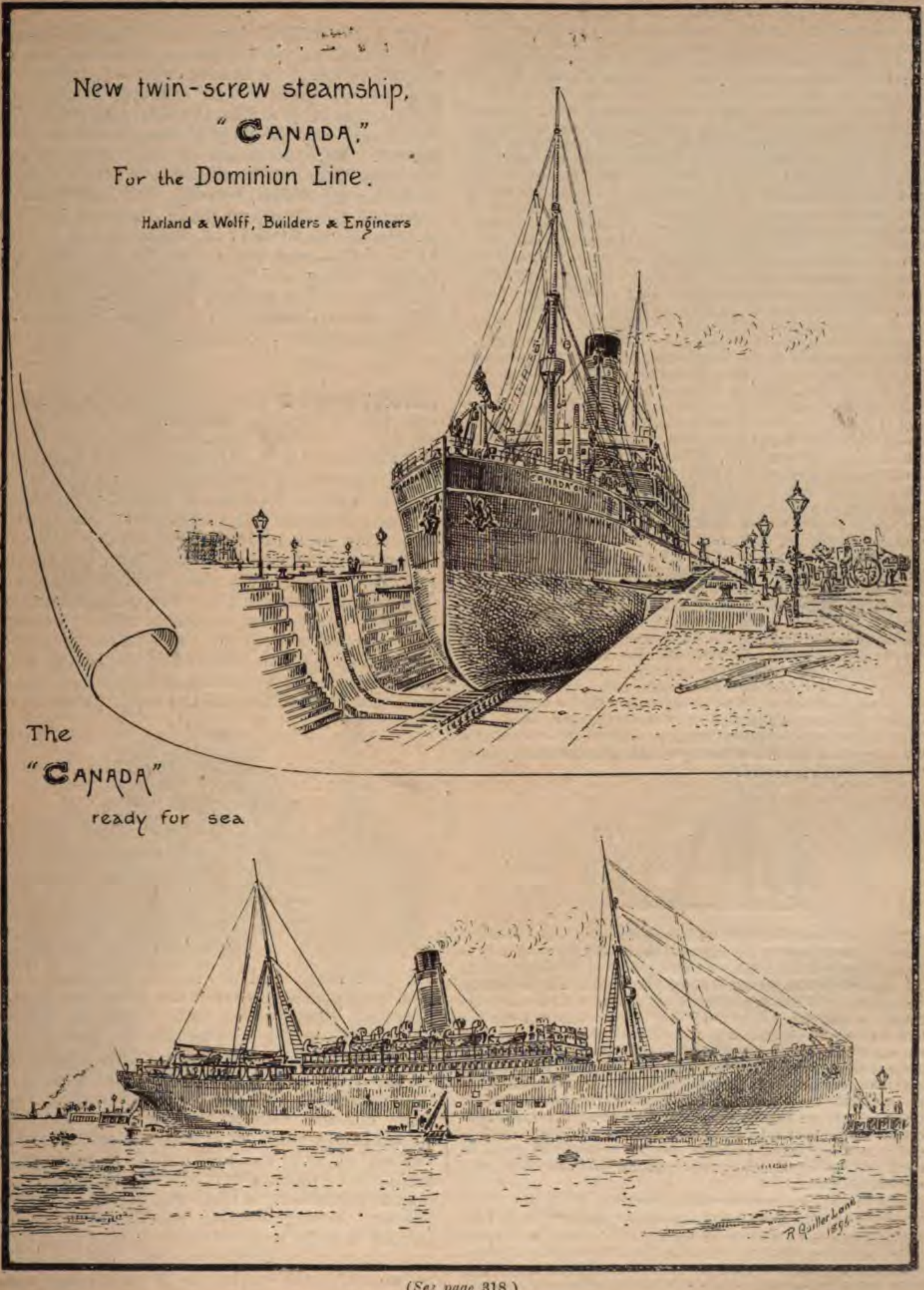
Returning to our engine, which we left with gauges showing 0 lbs., 100 lbs., and 0 lbs., while so loaded admit steam at the right-hand end till its gauge also stands at 100 lbs., the load-indicator for this right-hand piston will now show no load, while the other piston's load is unchanged, thus the "balancing" force of the indicator spring has been transferred to this newly-admitted steam, which has loaded this piston with another load equal in magnitude, but opposite in direction, making the effective load of this piston nothing, as is shown by its spring indicator. Had the ordinary through rod, previously mentioned, existed, the "balancing" force it exerted on this piston would be transferred to this newly-admitted steam, while its "balancing" force on the other piston would be transferred to the spring of that piston's load indicator. Thus, whether this rod exists or not, we have an effective load on the left-hand piston of 100 lbs. by area of piston, while the right-hand piston has no effective load.

By Mr. Henderson's teaching the effective load on the right-hand piston is 100 lbs. by area of piston, and on the left-hand piston there is no load, for it has no effective area, since when the area of the right-hand piston is outlined on it, there is no marginal ring left, which results are not in accord with the above experimentally-obtained facts, and consequently they are wrong.

Returning again to our engine, let more steam be admitted to this right-hand compartment, till the gauges show respectively 0 lbs., 100 lbs., and 200 lbs., then will the right-hand load indicator show the same magnitude of load as it did when the gauges stood at 0 lbs., 100 lbs. and 0 lbs., but its direction will be reversed, so that we now have both indicators showing for their individual pistons, loads, equal in magnitude and direction, of 100 lbs. by area of piston; the collective effect of which, of course, is 2 (100 lbs. by area of piston), which would have been indicated at the left-hand, and sustained by *its* spring, instead of at and by the right-hand indicator's, had the through rod, before referred to, existed, and the load of the right-hand piston been transferred from its indicator spring to it, in accordance with the method of treatment adopted, this rod would, in its endeavour to effect "balance" at this right-hand end, exert an equal force at its junction with the left-hand piston's rod, from where it is transmitted, together with the left-hand piston's load, to the indicator, which now indicates the combined or collective load. Thus each piston's load is 100 lbs. by area of piston, whether this rod exists or not.

Mr. Henderson's ideas make the right-hand piston responsible for the whole load, and the left-hand one consequently has no load, which again do not agree with the experimental results, and consequently are wrong.

These experiments may be multiplied indefinitely; conducted with separate cylinders of the same, or different diameters; with


New twin-screw steamship,
"CANADA."
For the Dominion Line.
Harland & Wolff, Builders & Engineers
The
"CANADA"
ready for sea
R Guiller Lane
1896

(*See page* 318.)

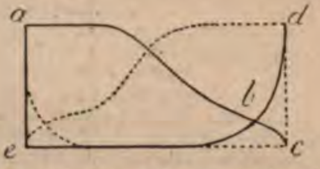
cylinders and pistons arranged as at Fig. 1 or Fig. 2, or any other way, provided the rod of each piston be arranged so that a load indicator may be attached to indicate each piston's individual effective load, with the one result, viz., that each individual piston's effective load will be that obtained by multiplying the difference of pressures acting on *that* piston at either side by area of *that* piston.

In arrangements of cylinders such as shown in Figs. 1 and 2, the rods may be arranged to work freely through one another. It is probable that had Mr. Henderson drawn his figures with such rods, we should never have heard of these mistaken views of his and Mr. Isherwood's. They are evidently an outcome of mistaken and unnecessary uses of the term reaction, which has led them into the error of considering the cylindrical column of steam acting between the two pistons as a solid body, or more correctly, as a "perfectly rigid body" in direction of its axis.

Mr. Henderson's imagined discovery, respecting the reduction of back pressure in compound and triple-expansion engines, is perfectly wrong in consequence of being dependent on these ideas, which have been shown by experiment to be wrong.

If the principles of mechanics be admitted, it will suffice to disprove this article of *Cassier's Magazine*, to remember that as a force is specified by its magnitude, direction, and point of application, and two or more forces acting at a point in the same straight line may be replaced by their "resultant," by considering the junction of the piston rod with its piston as the point of application of the two forces, due to the steam repulsive effort at each side of the piston, which may be considered replaced by their resultant, which is in magnitude, their difference; and as no other force which here concerns us acts at this point, this resultant will completely represent this system. No forces acting at a distinct and distant point, such as at another piston, can influence this resultant, no matter whether it be equal in magnitude, opposite in direction, and in the same straight line, or otherwise; for it is not part of *that* system. Two such forces could only be considered together, and as rendering each other non-effective when taking the two pistons as "perfectly rigidly connected," and the two systems as one system.

In defiance of the above, Mr. Henderson would make out that forces acting at various points in the same straight line, which correctly may be considered one system and replaced by a single resultant, may be divided into as many *minor systems* as there are points, each of which *minor systems* may be replaced by single resultants which act at their respective points, but which represent component forces which act at distinctly different points, and hence belong to distinctly different (minor) systems,—which is absurd.



It may not be out of place to here remind engineers, that the "true" power diagram for any cylinder during either stroke, is not as given by the indicator with its pencil on the paper during that stroke, but as drawn below, where *a*, *b*, *c* is the steam line, and *d*, *b*, *e* the back pressure line for that same stroke; the dotted line diagram being the "true" power diagram for the other stroke. In diagram *a*, *b*, *c*, *d*, *e*, the area *a*, *b*, *e* is positive, and the area *c*, *b*, *d* is negative; the similar areas on the other stroke diagram are similarly positive and negative. These negative areas largely influence the noise of the engine when running, and with inverted crank shaft engines, should be always largest on the down stroke diagram. The I.H.P. for both strokes collectively, is, of course, the same, whether calculated from the "true," or what may be termed the apparent diagrams; but considered separately as for "balance," there may be great difference.

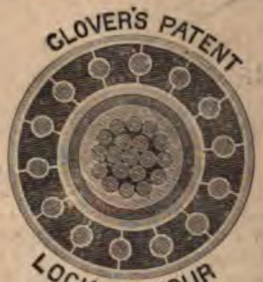
Santa Fe.—The torpedo-boat destroyer *Santa Fe*, lately built for the Argentine Government by Messrs. Yarrow & Co., has safely arrived at St. Vincent. She left Plymouth on Sunday, September 20th, and encountered the full force of the recent gale in the Bay of Biscay, which is one of the many illustrations of the sea-worthiness of this small class of vessel.

S.S. "CANADA."

THE Royal Mail twin-screw steamer *Canada*, of which we have pleasure in giving two views, represents her in Alexandra dry dock, getting lower part of hull painted and receiving stores prior to sailing; the other at wharf outside, just before sailing. The vessel was built by Messrs. Harland & Wolff, Belfast. Full particulars of the launch we gave in our June issue. The dimensions of the vessel are, viz:—Length, 500 ft.; breadth, 58 ft.; and depth, 31 ft. She has 6 cylinders, two 28½ in. diameter, and two 47½ in. diameter, and two 77 in. diameter, with a stroke of 54 in. She was taken out for her trial trip in Belfast Lough on Saturday, September 26th, and proceeded on her maiden voyage from Liverpool to Montreal on October 1st. Captain James M'Auley, of Ballymena, is in command.

IMPROVEMENT IN ELECTRIC CABLES FOR SHIPS.

MESSRS. W. T. GLOVER & Co., Salford, Manchester, are bringing out a new and improved form of armour for electric cables, which has been specially designed with the object of overcoming the difficulties and disadvantages usually met with in cables having an earth or bare return, and as cables of this class are frequently used in ship lighting, a short description of this invention will be interesting to our readers. It is well-known that if ordinary iron or steel wire armour is used for the purpose of conveying energy, especially in cables of large size, the weight of metal required to accommodate the current is so great, viz., about seven times that of copper, that the cables are both costly and unwieldy. In Messrs. Glover's new arrangement, however, the cables are completely sheathed with iron or steel segments forming a conductivity-wedge armour, the round wires being of intersected copper, thus reducing its weight, and at the same time giving a complete steel armour, which is far superior to that of round wires. The surface of the conductivity-wedge armour being smooth and continuous enables the cable to be nicely finshed, whilst at the same time it is protected from accidents by picks, stones or sharp instruments, which might otherwise force their way through a round wire armour. It may be added that Messrs. Glover manufacture from the smallest to the largest sizes of cables required for ship-lighting purposes, the quality being guaranteed, and the length in which such cables can be supplied is practically unlimited.



THE DÜRR LIGHT.

THE British Oil and Gas Industries, of 115, Cannon Street, London, E.C., are showing a new form of light for burning hydro-carbon oils which is entirely self-contained and does not require compressed air or other fluid pressure to work it. We illustrate this lamp in the adjoining diagrams, of which Fig. 1 is an elevation (part sectional) of the complete lamp; Fig. 2 is an end elevation of the burner mechanism, and Fig. 3 is a view showing the lamp suspended upon a simple form of support. Referring to Figs. 1 and 2, it will be seen that the frame A, for suspending the apparatus, carries the petroleum reservoir B, which is fitted with a sieve. A pipe C from the reservoir has a petroleum valve D at its lower end. To the valve D is fitted a pipe E, with a union joint *a* and a removable sieve, and a back nut *b*, with a removable slide containing two small holes regulating the oil supply. Below is attached the combined retort, jointed by screws *h* and a projection containing two feeding holes leading the oil into the retort.

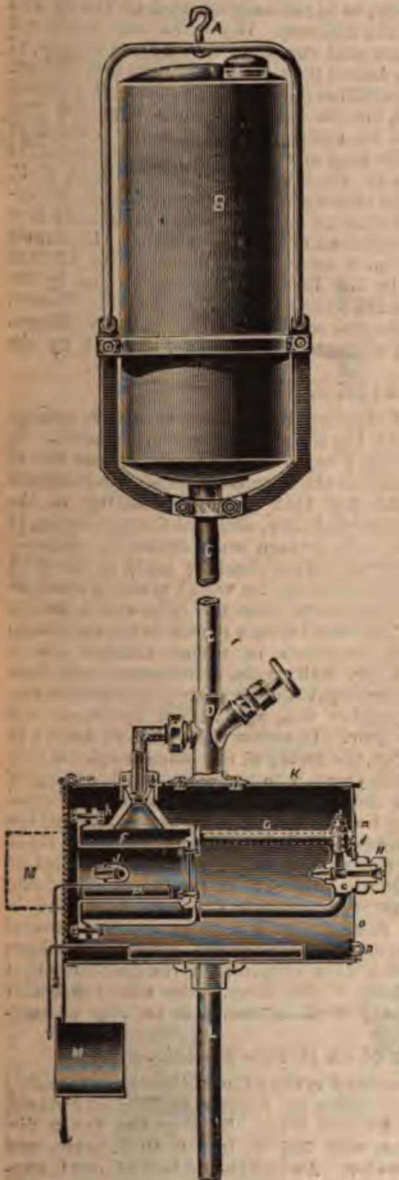


FIG. 1.

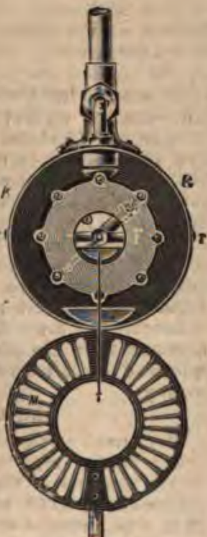


FIG. 2.

From the retort run the gas tubes G to the back burner for heating the retort. This burner has a removable cap H for cleaning purposes, and is attached to the cylinder end by a nut. The illuminating burner is situated within the retort. The cylindrical casing K is fitted at the back end with screws *r* to secure the end cover, and underneath is arranged a spigot L, for use with tripod in place of the suspending hook. The windguard M is hinged to give access to the retort. Removable superheaters P^1 P^2 are provided to start the lamp with. The method of lighting the lamp is to first charge the reservoir B with ordinary lamp oil, first having closed the valve D; the windguard M is now opened and the two superheaters P^1 P^2, filled with cotton waste soaked with spirits are inserted, the small one being placed under the front burner and the larger one under the retort, and when in place they are lighted.

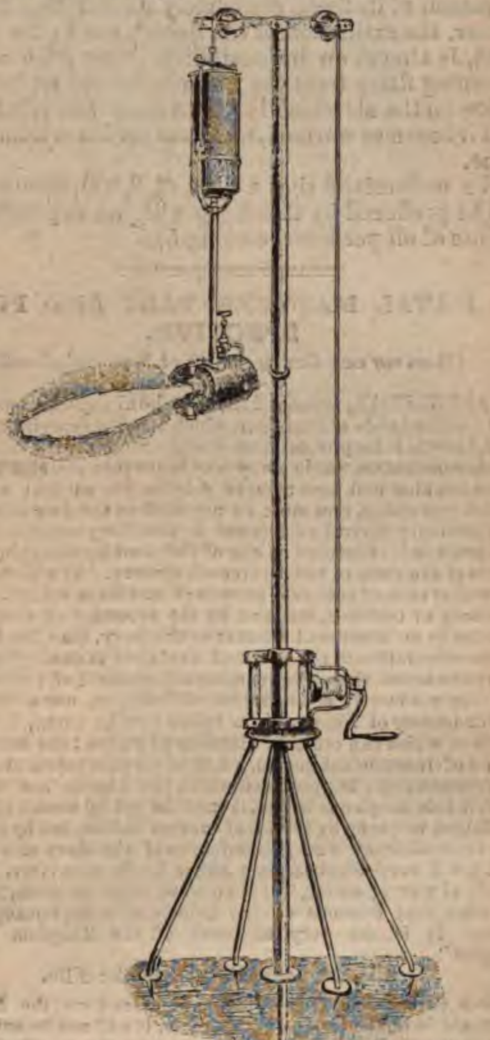


FIG. 3.

After the retort has been heated in this way about 10 minutes the valve D is opened, when a strong, sharp-pointed flame appears. The superheaters can now be removed, the flame adjusted, and the windguard closed. The lamp will now burn without attention until the reservoir requires replenishing with oil, which can be effected without stopping the light. From this description it will be seen that the light is generated by the automatic evaporation and superheating of ordinary lamp oil, which is conducted in drops into the retort. The back burner heats the retort, and by reason of its flame completely surrounding the front burner, the extinction of the light, even in the highest wind, is almost an impossibility. The high velocity of issuing flame from the burners causes an inductive action on the air which it draws in to the cylinders, so that it becomes warmed, and thus produces a smokeless flame.

We understand that a light of 3,500 candle-power can be produced by this lamp with an expenditure of 6 pints of oil per hour, costing 5½d.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(*From our own Correspondents at home and abroad.*)

WEDNESDAY, October 21st, was the ninety-first anniversary of the battle of Trafalgar, which London especially, but, indeed, the whole Empire, celebrated with extraordinary enthusiasm. The demonstration was in every way important and significant. It was a genuine and spontaneous celebration without a trace of official prompting, and must be regarded as another sign of that extraordinary revival of interest in the Navy which we believe will come to be regarded as one of the most remarkable developments of the close of the nineteenth century. The Navy League is another sign of this new growth of maritime ardour. It is to this body of civilians, inspired by the necessity of arousing the country to an intelligent interest in the Navy, that the initiation of the celebration of the lesson of Trafalgar is due. For it is to be remembered that this unexampled outburst of patriotic feeling was not merely a celebration of Trafalgar, nor a celebration of the memoy of Nelson. The battle was an event, the importance of which can escape no intelligent person; the commander, a man of transcendent genius, a man of peerless valour and matchless seamanship; but the need which the League has realised is that, if this Empire is to last, it must be not by means of another Trafalgar, nor even by the aid of another Nelson, but by maintaining the sufficiency and pre-eminence of the Navy at a standard which will render unnecessary either battle or saviour. In the words of a great writer, "It is no mere stake of pride, power, or prestige that depends on the indisputable supremacy of our Navy. It is the very existence of the Kingdom and the Empire."

The Gunboat Flotilla on the Nile.

Now that active operations have ceased on the Nile, and Dongola is in the hands of the victors, it will not be out of place before the matter is forgotten to refer to the excellent service performed by the gunboat flotilla on the Nile. Three of the boats were engaged with the forts at Hafir, where Commander the Hon. Stanley Colville was slightly wounded. The loss on board the gunboats was not severe, but some extraordinary risks were run, for not only was a hot fusillade from rifles poured upon them at close quarters, but the guns of the enemy were well served. In one case a shell was lodged right in the magazine, and but for the fact that the fuse was not in it, the boat must have been blown up and sunk. The *Tamia*, *Meternich*, and *Abu-Klea* were engaged in this affair, being commanded respectively by Commander Colville, R.N., Captain Oldfield, R.M.A., and Lieutenant Beatty, R.N. The fourth gunboat, under Commander Robertson, R.N., equally maintained the reputation of the Navy for dash, resourcefulness, and gallantry, but was delayed owing to a defect in the machinery. These boats were engineered by the contractors, and although we have not the names of those in charge, that they one and all did their duty is clear from the reports of the correspondents at the front.

American Torpedo Boats.

The tiny torpedo boat flotilla of the United States Navy is growing apace. Messrs. Herreshoff have just launched one of the two they are building, and she is, pending the selection of an appropriate name, to be known as No. 6. This boat, nominally of 26 knot speed, is expected to attain a speed of 27½ knots. Her machinery is of simple design, and she differs from the *Ericsson* and *Cushing* in having her auxiliary engines disconnected from the main engines. Furthermore, experience having demonstrated the disadvantages of a tube placed directly in the bow, it has been decided not to supply the new boats with this tube, and it will probably, as in the case of some of the British boats, be removed from the *Ericsson*. If all the new boats are placed in hand the class will consist of twenty-one vessels, of which the three first are named the *Cushing*, *Ericsson* and *Stiletto*. Whether the other boats will receive names appears at present to have been undecided, but the department has suggested that in these vessels should be commemorated the naval worthies whose memories should be kept green. Among those suggested for such commemoration are *Paul Jones*, *Preble*, *Farragut*, *Hull*, *Laurence* and *Porter*. The circumstance, however, that the lately-launched boat has not received a name, seems to indicate that this suggestion has not obtained official approbation. Contracts have been awarded for new boats to six firms. Two 30-knot boats are to be built by the Bath Ironworks, and one by the Union Ironworks. Two 22½-knot boats will be built by Messrs. Wolff & Zwicher. Three 20-knot boats will be built by Messrs. Herreshoff, two by the Columbian Ironworks, and one by the Charles Hilman Co.

Naval Mishaps.

During the month of October intelligence of several serious accidents connected with the Navy were received at home. In two instances these mishaps were attended with serious loss of life. From the China station the Admiralty received a telegram reporting that on September 11th a boat belonging to the *Narcissus* capsized in Grossevitch Bay, and that Captain Lang, of the *Narcissus*, and three able seamen were drowned. Captain Lang, it appears, had landed with a shooting party in the Fish river, and it was when returning to the vessel that the accident occurred. The disaster was seen from the ship, and a cutter under the command of Lieutenant Gaunt put off to the assistance of their shipmates, and succeeded in saving Captain David Mercer, of the Marines, Mr. Dalrymple, midshipman, and three of the boat's crew. A somewhat similar mishap occurred on the Pacific station on September 6th, by which a lieutenant and seven seamen lost their lives. It seems that when at anchor in Unalaska Bay on that day, the galley of the *Satellite* left the ship in charge of Lieutenant Hayman, who had volunteered to bring off two men who were on shore, and unable to return in a small boat owing to the strength of the wind. The galley reached the shore safely, but in attempting to return was unable to make headway in face of the violent squalls. The lieutenant therefore decided to put before the wind and row for the beach. In doing this the boat was swamped, and only one man succeeded in getting ashore alive. During the boisterous weather several other mishaps were reported, but although some writers have attempted to draw from these occurrences the deduction that seamanship is diminishing in the Navy, those who are better informed declare that any such inference is entirely untrustworthy.

Launch of an Italian Warship.

The launch of the armoured cruiser *Carlo Alberto*, a sister ship to the *Vetta Pisani*, took place on September 23rd at Spezzia, in the presence of the King of Italy. This cruiser has a displacement of 6,500 tons, with 325 ft. length, 59 ft. beam, and 22 ft. 6 in. draught of water. An end-to-end belt of steel, supplied from the Terni establishment, gives the principal protection, but there is further plating in the battery, the maximum thickness of steel used being 6 in. The battery is casemated, the guns being separated by bulkheads, and closed in above with 2-in. steel, while the armoured deck below is 1·4 in. thick. The principal battery consists of twelve 5·9-in. quick-firers, of which eight are on the broadside, in the casemates already described, and four at the corners of the deck above. She carries also six 4·7-in., ten 2·2-in., and eight 1·4-in. quick-firers, with five torpedo tubes. The machinery, consisting of two triple-

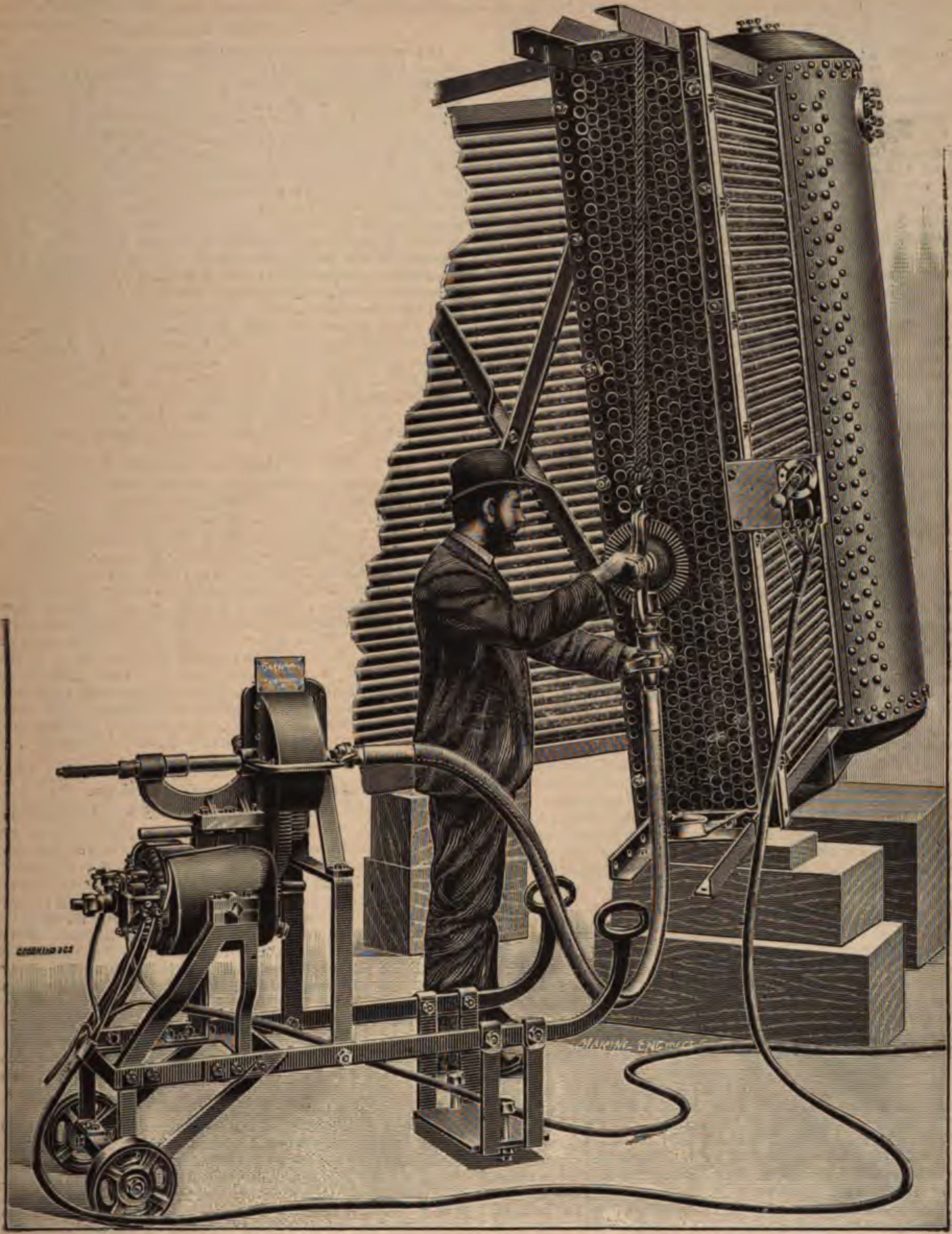

MARINE ENGINEER

Fig. 4.

Portable Electric Universal Drill. *(See page* 324.)

expansion engines, to which steam is supplied by eight boilers, in four compartments, is expected to give 13,000 H.P. with forced draught, and a speed of 20 knots. The contractors are Messrs. Ausaldo. The coal supply of the *Carlo Alberto* will be 1,000 tons, and she will also have convenience for liquid fuel. Her complement is to be 460 officers and men.

Chatham Dockyard.

The *Victorious* battleship, laid down here in May, 1894, and launched on October 19th, 1895, has now been completed for sea and will shortly join the Channel Squadron. The *Illustrious* battleship is making good progress, her engines and boilers are on board and she will certainly be completed by the beginning of the new year. The *Vindictive* cruiser is also being pushed ahead, and the *Minerva* cruiser may now be said to be ready for the pennant, although there still remain many of those little details to be finished which though not imperatively necessary are customary and conducive to the well-being of a warship and her company. The *Diana* has been delivered here by the Fairfield Co., and her trials have been satisfactory, with the *Venus*, she is among the new ships which are being completed for sea at this yard. There is not much repairing work going on. The *Endymion* has undergone a slight refit before leaving for the Mediterranean with relief crews; the *Sappho* is also under repair, but should not be long in hand; the *Leander* and *Arethusa* also absorb a few hands, but new construction now takes precedence of repairing work, and in many ways the new policy carries its own justification. The machinery of the *Vindictive* cruiser is being built in this yard, and considering the great success of that built for the *Minerva* cruiser, it is not surprising that the Admiralty continues to look with favour on this department of the dockyard. Preparations are making for the building of the *Goliath* battleship, she is to have Belleville boilers and the machinery will be supplied by Messrs. Penn, of 13,500 H.P. She will be laid down in January.

Naval Officers and the Bluecoat School.

For many years past the sons of indigent and poor naval officers were educated free of expense at Christ's Hospital, and hundreds of young fellows who afterwards served their country gallantly afloat received instruction at the Bluecoat School. Some short time since this privilege, under a mistaken impression, was taken away from naval men, and it needed a long and arduous fight, on the part chiefly of Mr. Lambert, of Greenwich Hospital, to get the matter put on its former and fairer footing. As a result the Council of Christ's Hospital are now engaged in entering on the foundation naval officers' sons, but owing no doubt to the fact that the news of the altered regulations has not yet reached as wide as it ought, the applications have not been made in sufficient numbers to fill the existing vacancies. This state of things can only be remedied by making it widely known that a boon for poor naval officers' sons is thus going a begging. Those who are interested can learn all about the concession by writing to the clerk of Christ's Hospital, who is ready to give information to all inquirers.

The United States Warships.

The Newport News Co., of Virginia, the Union Ironworks, of San Francisco, and the Messrs. Cramp have secured the contracts for the three battleships, for the construction of which authorisation was made by the United States Government. The three ships are to be named the *California*, *Alabama*, and *Pennsylvania*, and will in all their general features resemble the *Kearsage* and *Kentucky*, which are already building at News. The following are to be the chief characteristics of these new vessels:—Displacement, 11,500 tons; length, 368 ft. 3 in.; beam, 72 ft.; draught of water, 25 ft. The side armour, of Harveyed nickel steel, will vary in thickness between 4 in. and 16½ in., and will be about 7½ ft. deep. The steel protective decks will vary from 3 in. to 5 in. in thickness, and the battery will be further protected by bulkheads and casemates. The armament will consist of four 13-in. guns, carried in pairs in armoured turrets, fourteen 6-in., and other lighter quick-firers. A speed of 16 knots is to be given by engines of 10,000 H.P., and the coal stowage will be 1,200 tons. Secretary Herbert, in announcing the termination of the premium system, alludes to its advantages in the case of yards new to warship building, but states his conviction that with the experience gained, the time has arrived when it may be profitably abandoned. The danger is lest with a premium based solely upon speed attainments, especially when applied to battleships, it might have a disastrous effect by inducing the builder to make speed the dominant consideration, with detriment to other necessary qualities.

Devonport Dockyard.

The retirement of Rear-Admiral Church from the position of superintendent of the yard has been expected for some time, owing to the ill-health of this gallant officer. His successor is Rear Admiral H. J. Carr, who is expected to be fully as popular as his predecessor. The *Magicienne*, from the West Indies, is to pay off here instead of at Portsmouth, and rumour has it that she will be brought forward for foreign service in the East Indies. The *Doris*, from Barrow-in-Furness, has been delivered here, and make the fourth vessel preparing for commission at this port, the others being the *Renown*, battleship, and the cruisers *Arrogant* and *Juno*. The scheme for the extension of Keyham Yard is making good progress, and by the end of the financial year one will be able to say a good deal more about its appearance than at present. The *Ocean*, battleship, will be laid down here in December, and preliminary work has already begun. We shall have the start both of Chatham and Portsmouth, but with their longer experience it will be a great feather in Devonport's cap if its ship is ready first. No. 3 building slip is being enlarged on purpose for the operations. Among other vessels which have left the yard during the last month are the *Blake*, *Talbot*, and *Flora*, while on the other hand the *Edgar* has paid off after her commission in China. The *Furious* will be ready for launching next month if all goes well and no postponement is made.

The Torpedo Boat Destroyers.

The total number of torpedo-boat destroyers now built, building, or on order for the Fleet, is 90, and it is expected that orders for ten more, of five knots more speed than the fastest now constructing, will be given out before the end of the financial year, making 100 altogether. The names of the 90 boats are as follows:—*Albatross*, *Angler*, *Arab*, *Ardent*, *Ariel*, *Avon*, *Banshee*, *Bat*, *Bittern*, *Boxer*, *Brazen*, *Bruiser*, *Bullfinch*, *Chamois*, *Charger*, *Cheerful*, *Conflict*, *Contest*, *Coquette*, *Crane*, *Cygnet*, *Cynthia*, *Daring*, *Dasher*, *Decoy*, *Desperate*, *Dove*, *Dragon*, *Earnest*, *Electra*, *Express*, *Fairy*, *Fame*, *Fawn*, *Ferret*, *Fervart*, *Flirt*, *Flying Fish*, *Foam*, *Gypsy*, *Griffen*, *Handy*, *Hardy*, *Hart*, *Hasty*, *Haughty*, *Havock*, *Hazard*, *Hornet*, *Hunter*, *Janus*, *Kestrel*, *Leopard*, *Lightning*, *Locust*, *Lynx*, *Mallard*, *Mermaid*, *Opossum*, *Osprey*, *Otter*, *Panther*, *Porcupine*, *Quail*, *Ranger*, *Recruit*, *Rocket*, *Salmon*, *Seal*, *Shark*, *Skate*, *Snapper*, *Spitfire*, *Star*, *Starfish*, *Sturgeon*, *Sunfish*, *Surly*, *Swordfish*, *Sylvia*, *Teazer*, *Thrasher*, *Violet*, *Virago*, *Vulture*, *Whiting*, *Wizard*, *Wolf*, *Zebra*, and *Zephyr*.

Launches of French Warships.

In September last the *Saint Louis* was launched at L'Orient, and in October, 1895, the *Charlemagne* at Brest. Now a year later and this battleship, of similar dimensions and characteristics, has been put into the water and named the *Gaulois*. She displaces 11,275 tons, has a complete steel belt at the water-line, carries her principal guns, four 12-in., coupled in turrets fore and aft as in our ships, and has engines of 14,500 H.P., to give her 17 knots, supplied with steam by Belleville boilers. A cruiser was also launched last month from the yard of the Société de la Gironde, at Bordeaux, and named the *Catinet*. She is of the second-class and is a sister to the *Protet*, of 4,065 tons displacement; she is 332 ft. long, 44 ft. 8 in. beam, and 21 ft. draught at the stern. She carries nothing but quick-firers, four of 6·2-in. calibre, ten of 3·9-in. and ten of 1·8-in. Also machine guns and a couple of torpedo tubes. Belleville boilers supply steam to engines of 9,000 H.P., intended to develop a speed of 19 knots.

Sheerness Dockyard.

The successful nature of the preliminary trials of the *Pelorus* cruiser has given great satisfaction in this yard, and everyone, from the Commander-in-Chief downwards, was rejoiced when a telegram from Plymouth announced that she had safely reached her destination, and that working at about two-thirds her natural draught H.P. her speed had been a little over 16 knots. The refit of the *Swallow* has been taken in hand because neither of the three vessels, *Barracouta*, *Dolphin*, *Gleaner*, put down for repair, have yet returned home for the purpose. It will not be long before the *Dolphin* is here now, as her relief has gone out to the Mediterranean. The *Champion*, after a short stay during the month, has left, and the repairs to the *Sans Pariel* battleship, are being carried out at the yard. The *Sheldrake* has also returned to her duties, thus releasing a few more hands for the cruiser *Proserpine*. As soon as this vessel is launched the *Pomone*, a sister ship bearing a name well known in naval annals, will take her place on the stocks. The *Landrail* has resumed her duties.

Russian Warship Construction.

According to the *Vie Domosti*, a battleship of 8,800 tons, of the *Rotislav* type, is to be laid down at Nikolaieff. The gun vessel *Gilyab*, of 900 tons displacement, will take the water this month from the new Admiralty yard, where the the *Pallada*, a cruiser of the *Diana* type, is to be commenced. A coast defence ironclad of the General Admiral *aproxime* class is also to be laid down at St. Petersburg. At the Baltic yard an enlarged *Russia*, of 14,000 tons displacement, has been begun, and several torpedo-boats are under construction. In two torpedo-boats, Nos. 16 and 102, petroleum has been supplied as fuel. The battleships *Oslabya* and *Peresviet* are to be launched next spring, and the Mediterranean Squadron is to be brought up to a strength of three battleships, one coast defence ship, two gunboats, one torpedo cruiser, and two sea-going torpedo-boats. What with this establishment and the large increase to the squadron in the Far East, the fleets of Russia now demonstrate determinated naval activity.

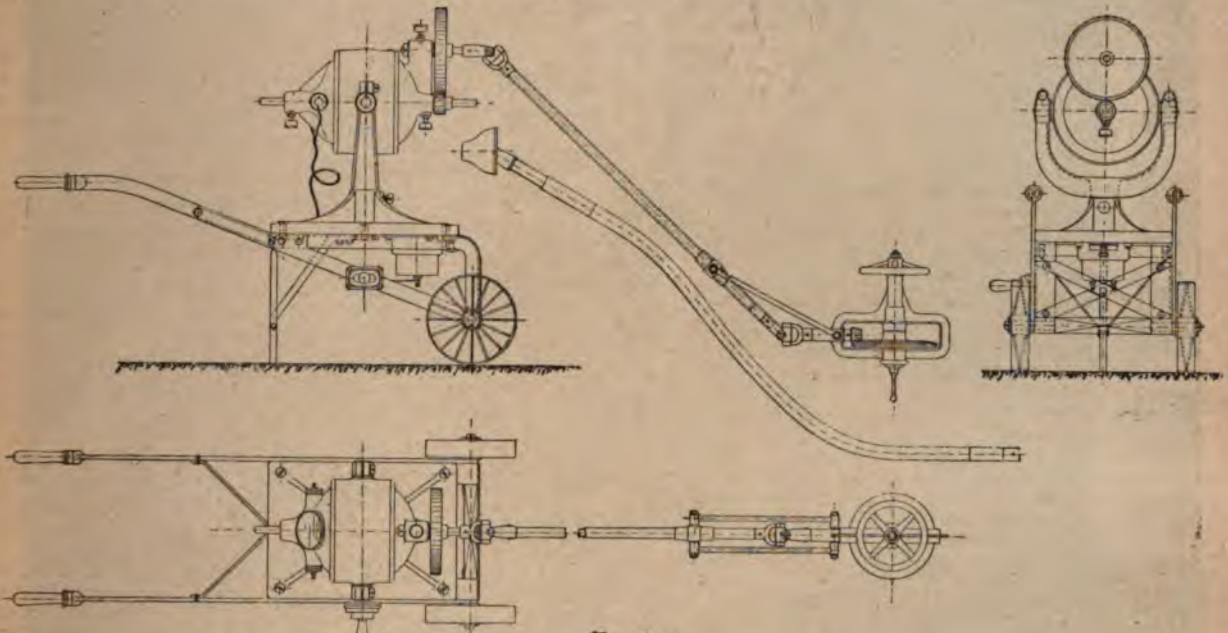


FIG. 1.

PORTABLE ELECTRIC UNIVERSAL DRILL. (*See page* 324.)

Steam Trials in the British Navy.

It is a common belief, says a contemporary, that the steam trials of ships give results that are utterly illusory. As a rule the vessels are not by two or three feet down to their full load draught. They are supplied with picked coal, and, as far as possible, with picked stokers; while there is no fault to find on the score of the sufficiency of engineer officers. The common belief having blossomed into an accepted doctrine, the Admiralty wisely decided to subject the *Majestic* to as severe a test as could with prudence be exacted. The choice of ship was excellent, as it is in the steam trials of battleships that the supposed unfair conditions are most manifest. Officially the ship is credited with 12,800 H.P. and 17½ knots speed with forced draught, but at her recent trials, extending over four hours and a half, the mean H.P. was 11,800 and the speed 16·85 knots, though during one run over the measured distance on the Cornish coast she covered 16·9 knots, or six-tenths of a knot under the official speed. No fault can be found with the conditions, as the ship was in her ordinary seagoing trim, with her own crew and all the weights and stores on board, while she was hampered during the trial by a strong cross wind. It has, therefore, been ascertained that the actual speed of the ships of the *Majestic* class for the purposes of war is the barest fraction under 17 knots, and though this may not be regarded as adequate, it is some satisfaction to know that we have ascertained the actual speed that can be relied upon, while we also know that we can depend upon these ships steaming at 16 knots with natural draught. Nor is it disappointing to know that forced draught gives an additional speed of only three-quarters of a knot, as, owing to the inconvenience caused to the men in the stokeholds, forced draught can never be resorted to except in grave emergency, and the fact that the advantage gained is incommensurate with the labour it involves will deter commanding officers from having recourse to it unless they are driven to it by the exigencies of battle.

Portsmouth Dockyard.

No. 15 dock is now practically completed, and the water has been let into it. In case of emergency the dock is ready for use, but as no ship is likely to want it the work will not be hurried on, but progress steadily. It is, however, a matter of congratulation that we have now two Government docks ready to take the *Powerful* class of cruiser. The machinery of the *Cæsar*, battleship, has been delivered, and she now goes into dock to have the rest of her armour put in place, and will be ready for the pennant early in the new year. The *Prince George* battleship is ready for commissioning, and before long will go into the Channel Squadron, the crew of one of the *Royal Sovereign* class being turned over to her, the ship so relieved going to the Mediterranean. The *Canopus* battleship is to be begun here in February next, but already work has commenced on her frames and flat and vertical keels. The fact is that the ceremony of laying the keel plate is no longer the first stage in the commencement of a ship, just as the ceremony of launching may or may not be a sign of her completion. A good many ships having cleared out towards the end of the month, the yard began to look a bit bare, but the *Revenge* has now come in and will remain some little time. The *Powerful's* trials have to be stopped for a time, and the *Terrible* is now to go ahead. The ships now ready for sea in this yard are the *Hercules*, *Sultan*, *Calliope*, *Iphigenia*, *Latona*, *Naiad*, *Indefatigable*, with several destroyers.

Pembroke Dockyard.

The progress of the *Andromeda* cruiser is in every way satisfactory. The plating of the vessel is nearly complete, and so is her sheathing. The new first-class cruiser to be laid down when the *Andromeda* is launched will be named the *Spartriate*, after a ship captured from the French at the Nile. She was also present at Trafalgar. The approaching launch of the cruiser, says a correspondent from the yard, has caused the authorities to direct attention to the question of providing a suitable berth for the ship while she is receiving her machinery and boilers. In ordinary circumstances she would be taken to Hobbes Point, and moored under the sheerlegs there, but this berth is now occupied by the battleship *Hannibal*. It is, therefore, proposed to moor her in the Haven and lift the machinery on board there. The adoption of this course would be out of the question if the boilers of the cruiser were of the ordinary type, as they would be far too heavy to be lifted with temporary appliances. The water-tube boilers, however, being much lighter, will enable the work to be done in this way, and although some risk will attach to the operation, it is anticipated that it will be attempted. The *Hannibal* is getting on well and there is no reason to anticipate that any change in the programme for her will be necessary.

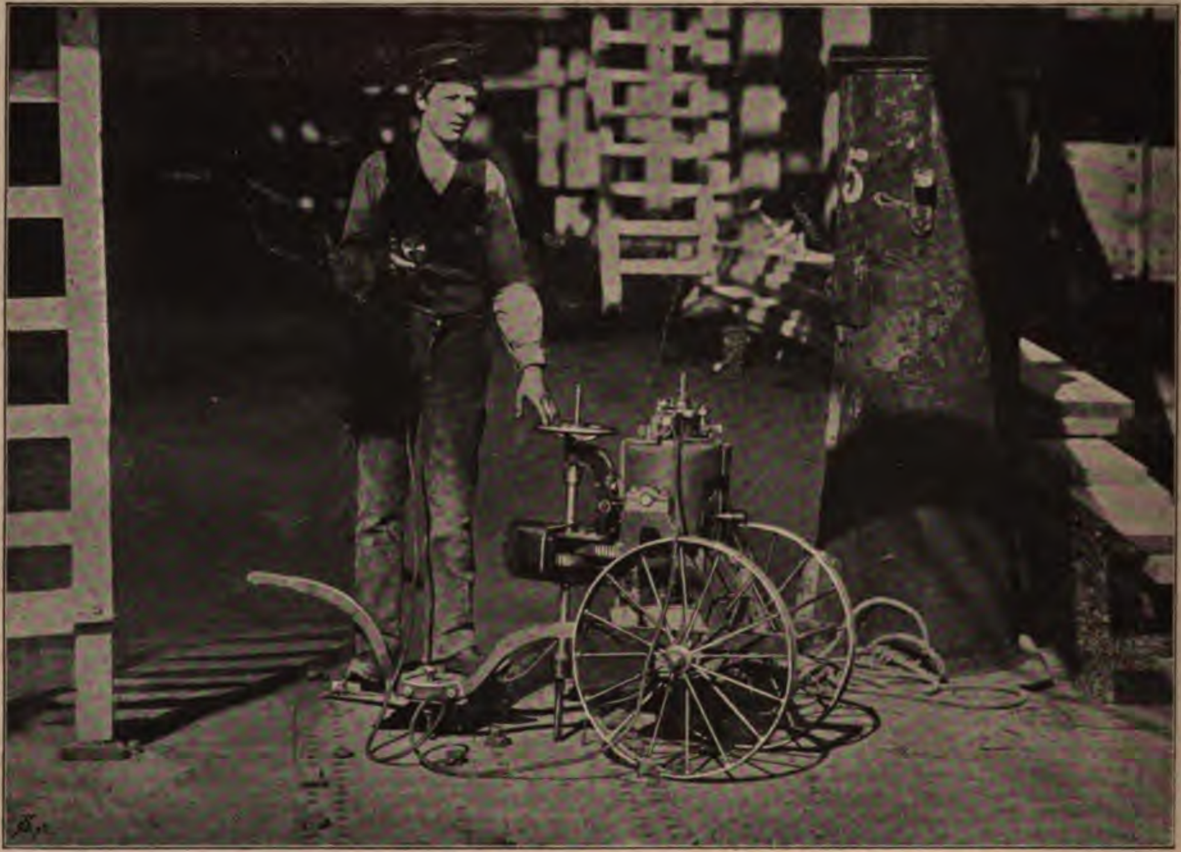


FIG. 2.

PORTABLE ELECTRIC UNIVERSAL DRILL.

MUCH attention is being devoted to the introduction of labour-saving machinery in many branches of the arts and sciences, and in this direction we are following the example of the Americans, to whom no doubt is due the honour of having initiated the system of portable power-driven tools.

In no work perhaps has so little advance been made in this direction till quite recently than in shipbuilding, boilermaking and other similar manufactures, although it will be obvious that there is plenty of scope to adapt tools with motive-power devices in a portable and compact form.

We have pleasure in giving four illustrations of a neatly-arranged portable electric drilling machine, patented by F. Kodolitsch, Esq., managing director of the Austrian Lloyd's Steam Navigation Co.'s Arsenal, of Trieste. These machines have been at work at the Arsenal in Trieste for over three years, and are giving excellent results. The machine can be adapted for almost any job, however difficult or inaccessible, either in the shipyard or the fitting shop. It is obvious that such an arrangement saves an immense amount of shop labour by being able to take the drill to the work, and not having to take the work to the drill; for example, any large casting can be finished complete by having all the holes drilled in it whilst it is being planed on the planing machine.

This machine can be employed in the shipyard for drilling and counter sinking all rivet holes, and also for cutting out side-light, scuttles and hawse-pipe holes. The stern-post bushes can also be bored out by using the machine. In the Austrian Lloyd's Arsenal there are over 2,000 men employed, and drilling holes by a rachet is now almost unknown. Each shop is fitted with a number of special machines, and a network of wires connects them with a large dynamo for working them.

Fig. 1 is the general arrangement of the No. 1 size machine, which drills holes from ¼ to 1 in. diameter.

This machine can be used for almost any kind of work, either for engineering purposes or for ship repairs. Fig. 2 is the machine for drilling holes in ships' decks, and tank tops or counter-sinking same. This machine can counter-sink 1,000 holes a day, or drill 400 $\frac{1}{2}$-in. holes in $\frac{1}{2}$-in. deck plates per day. For counter-sinking the workman simply lifts the counter-sinking bit out of one hole by elevating the handles, wheels it to the next, and dropping it in keeps it there till the operation is completed. Fig. 3 shows the drill at work on the bow of a steamer in dry dock.

In repairing stranded steamers the motors have proved most valuable for drilling out the rivets of the plates to be replaced. There are four sizes of the machine made, the largest size is for drilling holes up to $3\frac{1}{2}$ in. diameter, and is used principally for boring armour plates.

We hear that these machines are now employed extensively in the United Kingdom by ship repairers and engineers. Mr. Kodolitsch has successfully adapted his electrical motor for expanding boiler tubes in water-tube boilers, and Messrs. Yarrow & Co., of Poplar, have many of these machines at work. It was found that instead of being able to expand 70 tubes a day by steam power they were able to expand 30 tubes per hour by using the Kodolitsch motor. This special machine is illustrated in Fig. 4. Each machine is under the control of the man or boy who is working the drill. We made reference to these machines in our June issue this year, on page 108, in an article we gave with regard to the work that was then being carried on in Messrs. Yarrow's yard.

Mr. Kodolitsch has also successfully expanded tubes in marine boilers up to 4 in. diameter by using a similar special motor. It is impossible to enumerate all the varied uses to which these machines can be adapted.

We hear that Mr. Kodolitsch has appointed Mr. F. S. Dudgeon, of 30, Great St. Helen's, as his sole agent for the United Kingdom.

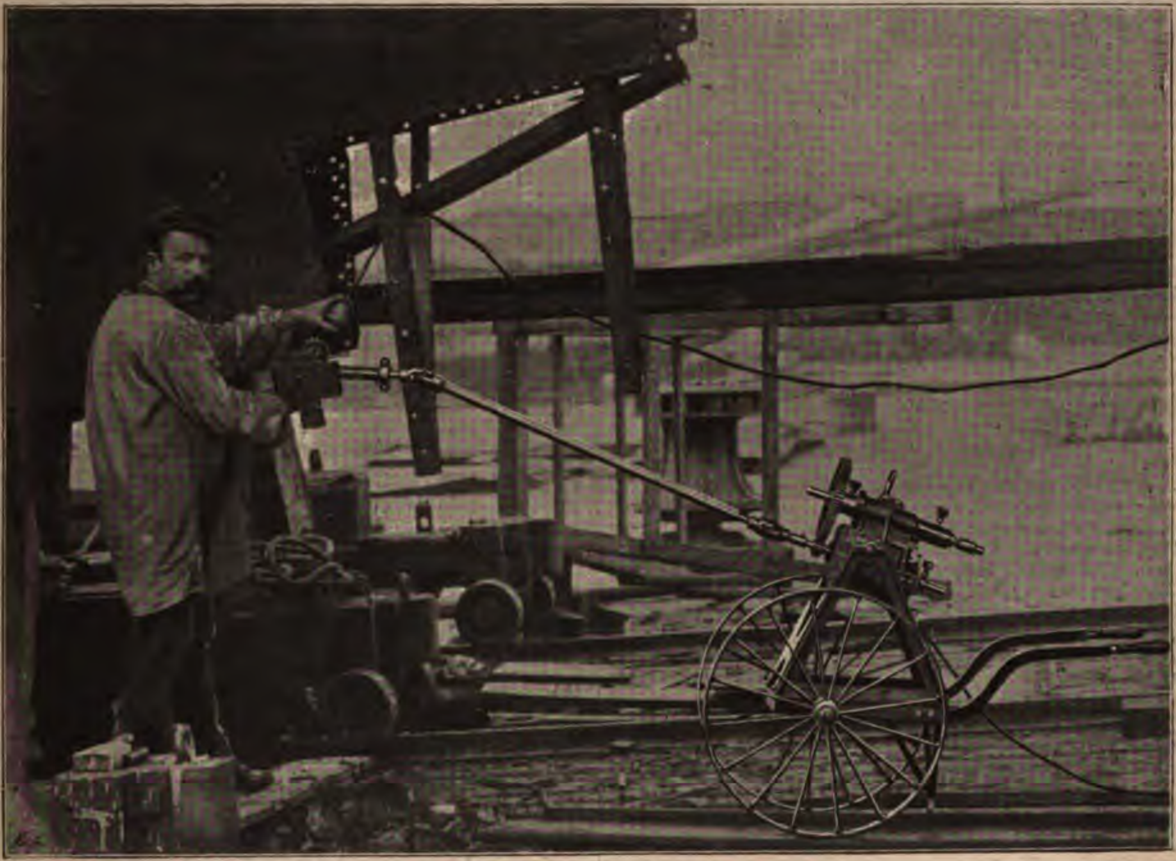


FIG. 3.

PORTABLE ELECTRIC UNIVERSAL DRILL. (*See page* 324.)

"Nomos" Compositions for Ships' Bottoms.—We have received from Messrs. R. T. Bruce & Co., of Hull, a long list of the names of vessels that have been recently coated with the above composition, amounting to some hundreds of thousands of tonnage, including ships from many distant ports. We would draw attention to the fact that a great number of the vessels in this list have previously used "Nomos," many of them for a considerable time, which is very good evidence of the good reputation it has obtained from the many important and influential owners whose ships are included in the list.

Institute of Marine Engineers.—Meetings are held at the above Institute on the second and fourth Mondays of each month. On Tuesdays and Thursdays drawing classes are held for the juniors, lectures on suitable subjects are also given them on Tuesday evenings.

Floating Dry Dock.—The Spanish Government is inviting tenders for the construction of a floating dry dock at Havana.

NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from September 25th, to October 24th, 1896:—

Adams, John H., staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet.

Agnew, John W., chief engineer, has been advanced to the rank of staff engineer in Her Majesty's fleet.

Bartwell, Charles W. P. S., engineer to the *Pembroke*, additional for the *Jupiter*, undated.

Bath, Frederick, assistant engineer to the *Galatea*, for the *Sheldrake*, to date October 1st.

Beckett, William H., acting engineer to the *President*, additional for temporary duty at the Admiralty, to date September 29th.

Bennett, James, M. C., fleet engineer to the *Royal Arthur*, to date September 26th.

Bennington, J. W., staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet.

Brown, Walter, chief engineer, has been advanced to the rank of staff engineer in Her Majesty's fleet.

Bykes, George R., assistant engineer (temporary) to the *Vulcan* when recommissioned, undated.

Crisp, Arthur S., engineer to the *Whiting*, to date October 3rd.

Dawson, Thomas J., assistant engineer to the *Alecto*, re-appointed on promotion, to date July 1st.

Dixon, Robert B., engineer to the *Pembroke*, additional for the *Victorious*, to date October 2nd.

Edwards, George K., engineer to the *President*, as Admiralty inspector of torpedoes, to date October 3rd.

Goodyear, Reginald H., (probationary) assistant engineer to the *Repulse*, to date September 26th.

Harris, Herbert W., engineer to the *Electra*, to date October 3rd.

Hewett, John B., assistant engineer to the *Anson*, when recommissioned, undated.

Hosken, William E., engineer to the *Recruit*, to date October 3rd.

Howle, Clifford, assistant engineer (temporary) to the *Vulcan*, when recommissioned, undated.

Hurst, J. E., staff engineer, has been advanced to the rank of fleet engineer in Her Majesty fleet.

Jameson, Thomas O., assistant engineer, to be lent to the *Excellent*, for torpedo and hydraulic instruction, to date October 3rd.

John, Arthur J., chief engineer, has been advanced to the rank of staff engineer in Her Majesty's fleet.

Kelly, John, assistant engineer to the *Anson*, when recommissioned, undated.

Liversidge, John G., engineer to the *President*, additional for R.N. College, to date September 29th.

Marshall, Frederick W., engineer to the *Defiance*, to date October 3rd.

Mitchell, Walter F., engineer to the *Dreadnought*, undated.

M'Laurin, John, engineer to the *Vulcan*, when recommissioned, undated.

Murray, Thomas W. S., assistant engineer to the *Vulcan*, additional, and for appointment when recommissioned.

Pedrick, John R. J., staff engineer to the *Anson*, when recommissioned, undated.

Rawlingson, W. W. H., engineer, has been promoted to the rank of chief engineer in Her Majesty's fleet.

Rawlingson, Walter W. H., chief engineer to the *Victory*, additional for the *Rattlesnake*, re-appointed on promotion, to date August 29th.

Roye, James A., engineer to the *Pembroke*, additional for the *Bittern*.

Sanders, John S., assistant engineer to the *Anson*, when recommissioned, undated.

Sercombe, Francis J., engineer to the *Racer*, to date September 26th.

Stevens, J. G., chief engineer, has been advanced to the rank of staff engineer in Her Majesty's fleet.

Stone, Alfred T., engineer to the *Griffon*, to date October 3rd.

Summerford, Horace G., assistant engineer to the *Anson*, when recommissioned, undated.

Teed, Henry R., engineer to the *Vernon*, additional for the *Jaseur*, *when commissioned, undated.*

Vining, Henry F., chief engineer to the *Victory*, additional for the *Seagull*, on her ceasing to be tender to the *Vernon*, undated.

Worth, Frederick, staff engineer to the *Vulcan*, when recommissioned, undated.

WILLCOX'S "IMPROVED" PROPELLER.

THIS propeller which has now been on the market for several years, and has become an established favourite with North-east coast shipowners, has recently changed hands, owing to the death of the patentee, the late F. W. Willcox, of the firm of Messrs. Wawn & Willcox. Mr. Wawn, the surviving partner of the late firm, having handed over all drawings and particulars relating to this patent to Messrs. Willcox Bros., the sons of the patentee, who have commenced business as consulting engineers and marine surveyors, at 68, John Street, Sunderland, they will carry on the sole manufacture (as well as the designing) of these propellers in future. Messrs. Willcox Bros. have made this class of work a special study, and have gained considerable experience in the drawing offices of several of the leading firms in the kingdom. Many of our North Country readers will be acquainted with the special features of this propeller, but for the benefit of others a short description may be given. In this propeller the ordinary design is merely improved upon, with the result that the vibration caused by the blades of the propeller revolving past the stern and rudder posts of the ship is diminished, and in some cases altogether removed, through the centring of each section of the blade upon a cissoid curve, the after edge of each blade being a straight line. By this form of construction, the blades pass the stern and rudder posts gradually and without violence. The reduction of slip—that is, the difference between the linear advance of the vessel propelled and that of the propeller due to its pitch, to the amount required to generate the requisite propelling force due to a given speed of ship—is effected by inclining the blade aft at a certain angle which depends upon the after run of the vessel, the outer edge of the blade being curved forward to such an extent as will cause the water flowing backwards from the propeller to take a cylindrical form equal to the diameter of the propeller, thus preventing the coning or spreading of the water, and thereby obtaining solid water for the blade to work in. The efficiency of the blade near the root is further improved by curving the leading edges from the boss outwards to the centre of area, and thereby doing away with the churning action which takes place from the propeller boss for a considerable distance towards the ends of the blades. Some hundreds of these propellers have now been fitted, and have given remarkable improvement in nearly every case, and they still continue to be in good demand. Owing to the increasing size of steam ships, Messrs. Willcox Bros. have found it necessary to get out designs for loose-bladed propellers made of gun metal, or the different high-class bronzes. It may be added that they have appointed Mr. Harry Gray, Dominion House, 110, Fenchurch Street, London, their sole agent for the South of England.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(*From our own Correspondent.*)

SHIPBUILDING here has very much improved during October, and orders for new tonnage have been fairly well distributed over the various districts both on the east and west coast, the upper reaches of the Clyde have also secured contracts for several vessels, and if trade and labour prospects continue to improve, an active winter is practically assured. The most important order given out during the month was from the Admiralty for two new cruisers, one to be built by the Fairfield Co., and the other by Messrs. James and George Thomson, Limited, Clydebank, which will keep these two big establishments in Government work for a season at all events, which is the more gratifying when it is remembered that the *Diadem* and the *Europa*, building at Fairfield and Clydebank respectively, are rapidly approaching completion. The length of the new cruisers between perpendiculars is 435 ft., the beam, 69 ft., and the moulded depth, 39 ft. 9 in. The displacement at the normal mean draught of 25 ft. 3 in. is 11,000 tons. These measurements place the cruisers second only to the *Terrible* and *Powerful*, and the differences are largely dictated to enable the new vessels to go through the Suez Canal. The new vessels are 65 ft. shorter than the two big cruisers named, and the boiler space is 64 ft. shorter. The 30 boilers require 132 ft. of the length of the vessel, and 4 ft. is saved in the length of the engine-room. Of course, this saving in space is at the expense of nearly two nautical miles an hour to speed. The fewer number of boilers results in a decrease of nearly 500 tons in the weight in the boiler compartments, which, by the way, are only divided athwartship, while the only athwartship coal bunker is right forward, the coal capacity being along the sides of the ship. In the machinery there is a further saving of over 200 tons, so that the less weight to reduce the draught for the navigation of the Suez Canal is largely at the expense of speed. The protection is the same, an armoured arched deck 4 in. thick on the slopes and 2½ in. elsewhere, and the rise is about 10 ft., the connection with the framing and shell plating being 6 ft. below the waterline. All the quick-firing guns are to be protected by 6-in. armour casemates hardened on the Harvey process. They will be only half a knot faster than the *Diadem* class.

Messrs. The Fairfield Shipbuilding and Engineering Co., Limited, Govan, launched on October 21st the *Diadem*, the first to be floated of the four first-class cruisers placed last year; the weather was fine, and there was consequently a very large attendance of spectators, the crowd being greatly augmented by the Fairfield hands, who held holiday for an hour or two in honour of the event. A large party of ladies and gentlemen were invited to the launch, afterwards the builders entertained them at luncheon in the drawing office. The launching ceremony was performed by Lady Currie, and the vessel entered the water amidst loud cheers.

Towards the foundation of an engineering laboratory at Glasgow a donation of £12,500 to the University was promised by the Bellahouston trustees on condition that an equal sum was forthcoming from other sources. This sum, we believe, the committee have succeeded in nearly raising, and it is expected that the new buildings will be commenced in the coming spring. Meantime the University Court, acting in conjunction with the Engineering Laboratory Committee, has arranged for the equipment of a temporary engineering laboratory in the present University buildings, and thus, for the first time, the University School of Engineering Science will have facilities for the instruction of its students in experimental work and for the investigation of problems bearing upon engineering practice.

Mr. W. R. Sneddon, head draughtsman in Messrs. Carmichael, Maclean & Co.'s shipbuilding yard, Greenock, has been appointed manager and head draughtsman in Messrs. Day, Summers & Co.'s shipbuilding yard, Southampton; and Mr. Paterson, draughtsman in Messrs, Caird & Co.'s, has been appointed to the post vacated by Mr. Sneddon.

Mr. Andrew Laing has, we are informed, been appointed general manager of the Wallsend Slipway and Engineering Co., Limited, Newcastle-on-Tyne. The appointment is considered an important one, and is in line with a movement that has been in progress for some time. Not a few North-East Coast men have been appointed to Clyde yards with the object of bringing to the Clyde a proportion of the class of work which largely is built in that district, and now there is apparently a desire, chiefly on the Tyne, but not confined to it, to compete with the premier shipbuilding river for the very high-class work which formerly was exclusively done on the Clyde. Mr. Saxton White and Mr. Laing, who were both actively engaged in the construction of the *Campania* and the *Lucania*, are now in the employment of Tyne firms.

The final copestone of the Cessnock Dock was laid on October 2nd by the Lord Provost, Sir James Bell. A good deal of dredging has still to be done, but the ceremony practically completed the 11,211 lineal feet of quay wall embraced in the dock, and the 2,877 lineal feet left unformed at the date of the last official inspection. The copestone is laid at the east end of the dock, near the south-east corner of the south basin, and rests on a granite memorial-stone, specially prepared by Messrs. Freeman, Sons & Co., Limited, who have supplied the bulk of the granite coping of the dock, and up till now the whole of the granite required in the construction of No. 3 Graving Dock. The memorial-stone is 8 ft. long, 2 ft. 6 in. high, and occupies two courses in depth of the granolithic-faced ashlar on the face of the quay wall. On it has been lettered by Messrs. Freeman the following inscription:—

THE ACT FOR THIS DOCK WAS PASSED IN 1883.
HON. JOHN URE, LORD PROVOST, CHAIRMAN.
WORKS COMMENCED 1886.
LAST COPESTONE LAID ON 2ND OCTOBER, 1896,
BY THE CHAIRMAN, HON. SIR JAMES BELL, BART.,
LORD PROVOST.
CHAIRMAN OF WORKS COMMITTEE, DAVID RICHMOND.
ENGINEER CONSTRUCTOR, JAMES DEAS.
RESIDENT ENGINEER, ARCHIBALD HAMILTON.

The north basin, the centre basin, and the canting basin of the dock have now been dredged to 22 ft. and upwards at low water and 33 ft. and upwards at high water, and the quayage of both basins and the canting basin has been in daily use for some considerable time. Only the south basin remains to be dredged, and three or four months should see that accomplished.

Messrs. The Caledonian Shipbuilding and Engineering Co., Limited, Dundee, have contracted to build for the Cork Steamship Co.'s coasting trade, a steel screw steamer of 800 tons; also for Indian owners, a steel steam screw yacht of 100 tons.

Messrs. Gourlay Brothers & Co., Dundee, have contracted to build and engine a paddle steamer. A large screw steamer, carrying about 5,000 tons deadweight on a light draught of water for Messrs. David Bruce & Co., London and Dundee, and for Colonial owners a large new tug-boat.

Messrs. Scott & Co., engineers and shipbuilders, Greenock, have contracted to build for Messrs. J Hardie & Co., Glasgow, a-four-masted steel sailing ship, of 3,800 tons deadweight carrying capacity. The vessel will be of the following dimensions:—Length, 295 ft.; breadth, 43 ft; and depth, 24 ft. 8 in.; and is a duplicate of one recently placed with Messrs. Scott by the same owners.

Messrs. Carmichael, Maclean & Co., shipbuilders, Greenock, have received an order through Messrs. Thomas M'Laren & Co., Glasgow, to build a steamer of about 2,000 tons register for Messrs. Love & Stewart, timber importers, Glasgow, for their Baltic timber-carrying trade. The vessel will be of the following dimensions:—Length, 225 ft.; breadth, 34 ft.; and depth, 15 ft. 3 in. She will be furnished with triple-expansion engines, and fitted with all the latest and most approved appliances for the rapid handling of cargo.

Messrs. The Fairfield Shipbuilding and Engineering Co., Limited, have contracted to build and engine a steam screw yacht for Mr. Harry M'Calmont. The vessel will be almost a duplicate of the *Giralda*, which was built at Fairfield two years ago for Mr. M'Calmont, and which has been sold to an American gentleman. They have also, we understand, secured an order from the Castle Line for the construction of a new liner, which will be the largest yet built for this line.

Messrs. Russell & Co., shipbuilders, Port-Glasgow, have received an order to build two first-class high-speed paddle steamers for passenger service on the River Clyde for Captain John Williamson. These steamers will be similar in design to the *Glenmore*, built by Messrs. Russell & Co., for Captain Williamson last year, and which was recently purchased for service in Siberian waters, but they will be 10 ft. longer, with 3 ft. more beam. The engines will be supplied by a Greenock firm. Messrs. Russell & Co. have also sold two 5,000-ton carrying steamers, which they were building to their own account, and they are about to lay down the keel of another steamer of similar dimensions.

Messrs. Ramage & Ferguson, Limited, Leith, have received an order for a full-powered steam yacht of 500 tons, to be built from designs by Messrs. Cox & King, London.

Messrs. William Hamilton & Co., shipbuilders, Port-Glasgow, have received an order to build for Messrs. Hickie, Borman & Co., London, a three-masted steel sailing ship of 3,400 tons deadweight carrying capacity. She will be an exact duplicate of the *Willscot*, launched on September 5th, by Messrs. Hamilton & Co., for the same owners. They have also contracted to build a steel screw steamer for a firm with whom they have previously done considerable business. The new vessel is to be employed in Continental passenger traffic, and will be supplied by a Glasgow firm of engineers with triple-expansion engines to develop a high rate of speed.

Messrs. A. Rodger & Co., shipbuilders, Port-Glasgow, have contracted to build a sailing barque of 2,800 tons, similar in dimensions to the *Lindley*, launched by them on September 24th.

Messrs. Robert Napier & Son, shipbuilders, Govan, have laid down the keel of a screw cargo steamer, 280 ft. long, for the Glasgow Glen Line; they are also reported to have secured from a Roumanian steamship company an order for three steamers of fully 3,000 tons each.

Messrs. Barclay, Curle & Co., Whiteinch, have, we understand, booked an order for a steamer for Japanese owners; they have also contracted to construct the engines for another of the three Cunard Line cargo boats being built at Messrs. Workman, Clark & Co.'s yard in Belfast. The fact of these orders having come to the Clyde is due to the Belfast firm's engineering department having been destroyed by fire.

Messrs. the London and Glasgow Engineering and Shipbuilding Co , Limited, Govan, have received orders to build two steamers of considerable dimensions, one for a China steamship company, and the other for the Glen Line (Messrs. M'Gregor, Gow & Co.).

Messrs. Charles Connell & Co., shipbuilders, Whiteinch, have contracted to build for Messrs. James Gardner & Co., Glasgow, a screw cargo steamer of 4,000 tons, and will carry 6,000 tons deadweight. Messrs. Dunsmuir & Jackson, Govan, will supply the engines.

Messrs. William Denny & Brothers, Dumbarton, have secured an order to build a high-speed passenger paddle-steamer, of about 250 ft. in length, for service on the River Thames, and is to be ready for next season's traffic.

Messrs. Archibald M'Millan & Son, Limited, Dumbarton, have secured an order from Messrs. William S. Miller & Co., steamship owners and brokers, Glasgow, to build a steel screw steamer to carry about 3,000 tons on a very light draught of water. Messrs. Muir & Houston, Limited, Glasgow, will supply machinery of good power and of the most improved description.

Messrs. J. G. Rowan & Co., Greenock, have received an order from the Naval Construction and Armaments Co., Barrow-in-Furness, for the upholstery furnishings of the new twin-screw passenger steamer *Duchess of Devonshire*, building for the Barrow Steam Packet Co., for their passenger service between Barrow, Belfast, and Isle of Man.

Messrs. Ritchie, Graham & Milne completed in October a stern wheel steamer, 140 ft. by 24 ft., to the order of Mr. Alex. Wilson, 172, Fenchurch Street, London.

Messrs. Gow, Harrison & Co., shipowners, Glasgow, have placed a contract for a cargo steamer of close on 6,000 tons deadweight, with Messrs. Short Brothers, shipbuilders, Sunderland.

Messrs. Hugh Blaik & Co. are agents in Leith for a new line of steamers which have lately commenced to run between Calais, Leith, and Burntisland, the vessels sailing at intervals of about ten days.

Institution of Mechanical Engineers.—The ensuing ordinary general meeting of this institution will be held on Wednesday evening, 4th November, and Thursday evening, 5th November, at 25, Great George Street, Westminster, by kind permission of the Council of the Institution of Civil Engineers. The chair will be taken at half-past seven p.m. on each evening by the *President*, E. Windsor Richards, Esq.

TRADE NOTES FROM THE TYNE, WEAR, TEES, HARTLEPOOLS, &c.

(From our own Correspondent.)

THE TYNE.

Shipbuilding.—The remarks which we ventured to make last month, with reference to a coming revival in shipbuilding, have already been amply verified. Within the past fortnight especially, the enquiries for new tonnage have increased amazingly, and orders representing an enormous amount of tonnage have been placed. It can be said with absolute accuracy that not a single firm in the district has failed to add to their work account, and in some instances, offers to place orders have had to be declined. The state of affairs indeed, very much resembles that condition which in former days usually preceded the advent of a "boom," and which it was hoped was an experience not likely to be revived. Most business men have a dread of "booms," which mean an immense accession of worry and hurry for a few months, or possibly a year or two; to be followed by a similar, or a much longer period, of stagnation. They would much prefer a state of steady going business from year to year, without variation or fluctuation. But trade cannot be regulated to suit people's wishes, and all that sensible men can do is to accommodate themselves to its changes, and make the most of their opportunities at the time of the "rising tide." At the present moment, all the conditions seem to exist which are supposed to indicate a coming pressure of work, and the impulse which is now being given to trade is of an essentially different character to the "false starts" that have been so frequent during the last few years. For the first time since 1890, the docks and rivers of practically all the ports of the United Kingdom are clear of idle tonnage, and in some special trades the available carrying accommodation is not equal to requirements. Freights have risen since the beginning of the month in some cases 100 per cent., and still continue to show an upward tendency. A number of causes have united to bring about the change from slackness to activity; but that kind of speculative enterprise which strives to anticipate demand is happily not amongst them, and those who are disposed to be timid or sceptical may dismiss their fears and doubts, and accept it as a fact that whatever revival there is, is genuine.

Claims for advances of wages will very soon be heard of; for the workmen are exceedingly keen to take advantage of any change in trade which seems to favour their desire for higher remuneration. So keen are they indeed to put forward claims in this direction that they have on some occasions done so when there was not the least evidence of trade expansion presented. It is to be hoped that under present circumstances they will not commit themselves to any course of action that might needlessly hamper employers in their efforts to secure contracts sufficient to keep their works going, not only for a few months, but for a year or two if possible. It will be greatly to their own interest not to be precipitate, and an attitude of quiescence while trade is still in the transition stage will prove their wisest policy. By keeping back their claims till trade has arrived at an all-round condition of prosperity they will, in all probability, ensure compliance with their reasonable demands, and that without appeals to force and without threats, which are equally objectionable.

It is reported that Messrs. Armstrong, Mitchell & Co. are about to acquire possession of an unoccupied shipbuilding yard in the mid-Tyne district. As there is only one such yard in the locality indicated, *i.e.*, Messrs. Schlesinger & Davis's, that, of course, is the establishment referred to. We have no doubt that the report will prove to be correct, for the company have more work than they can deal with in their two great yards at Elswick and Low Walker, and the yard which has lain so long unused at Wallsend is admirably adapted for economical shipbuilding. Some months ago the company acquired the Scotswood yard, but that establishment is only being used as a storing place for wood, pig-iron and other descriptions of material, being (unlike the yard at Wallsend) unfavourably situated for shipbuilding. Readers of this page may have noted that the Armstrong Co.'s Low Walker yard, as well as that at Elswick is now largely occupied with war vessels. And under these circumstances, it may be considered probable that the company's latest acquisition will be utilised for the building of merchant vessels.

It is understood that Messrs. C. S. Swan & Hunter have booked some important orders, and these, with the work already in hand, will keep the berths fully occupied for many months to come. Besides the large pontoon dock for the Smith's Dock Co., North Shields, the firm have launched several exceptionally fine vessels this year, and so far as they are concerned the returns at the end of the year will show a very creditable output. In addition to the new work they have in hand a very important re-classing contract, the work on which affords as much employment for labour as the building of a new vessel.

The state of work at Messrs. Richardson's and at Messrs. Dobson's yards is active, and material is being delivered in large quantities. Messrs. Hawthorn, Leslie & Co. are still busy on large vessels for the dead meat trade and on torpedo destroyers. It is understood that they have recently booked orders for vessels of a special class, and in their forge department business is particularly brisk.

Messrs. Robert Stephenson & Co. have received from Messrs. McIntyre & Co. an order for a steamer of 5,000 tons carrying capacity. The engines will be supplied from the firm's engineering department, South Street, Newcastle. It is understood that the firm have also been commissioned to build a light ship for the Trinity House, and they have, in addition, a contract from Spain for the building of a large floating dock to be located somewhere in the Philippines. This latter has to be taken to pieces after construction, and to be shipped in sections to its destination, where it will be reconstructed, and finally completed.

The Tyne Shipbuilding Co. have been among those who have booked orders, and the Palmers' Co. have not let the opportunity pass without increasing the number of their prospective engagements. At the works of both firms frame turning is proceeding briskly, and recently launched vessels are receiving their equipments preparatory to being handed over to the owners.

Messrs. Readhead have four vessels on the stocks, and more than that number to follow when berths are vacant. Frame turning is proceeding briskly, and great activity exists in every department. The firm's large graving dock continues to be constantly occupied with vessels under repair, one succeeding another as quickly as practicable, and there are also vessels getting overhauled at the mooring station beside the yard.

Many of the other repairing establishments are kept busy, and at the moment there are very few graving docks without occupants. In the small yards at North and South Shields business has increased, and there is a probability of further improvement.

Engineering.—Business at all the engineering shops is brisk, so much so indeed that in many cases a sufficient supply of labour to meet current requirements is not forthcoming. So far as regards engineering establishments engaged in the manufacture of steamship accessories, Messrs. Donkin & Co.'s (late Donkin & Nichol), Gallowgate, Newcastle, is among the busiest. The steering gears made by this firm have such a widely extended reputation that orders for them are constantly being received from foreign countries as well as from users at home, and steadiness of work is consequently a characteristic of this establishment. Their engine-room telegraphs are also widely known and appreciated, and the manufacture of them contributes materially to the uniform briskness witnessed at the works.

The extensive engineering works at Gateshead, known as Black & Hawthorn's, have been taken over by Messrs. Clarke, Chapman & Co., and will be put in operation by the latter firm as soon as practicable. The place is well equipped with first-class machinery, suitable for marine and locomotive work, but it is probable that the present possessors will put down additional plant, such as is used at their existing works (the Victoria Works, St. James's Road, Gateshead), so as to be in a position to relieve the pressure at the latter establishment. This is an excellent thing for the locality, as there was at one time a probability that the works (Black & Hawthorn's) would meet a similar fate to that which befell another Gateshead factory which discontinued operations a few years ago, and has since gone utterly to ruin.

Messrs. Thos. Proctor & Son, ironmongers and manufacturers, Side, Newcastle, have leased a large building contiguous to Messrs. Holzapfel's paintworks, South Shore, Gateshead, to which they intend removing the manufacturing branch of their business as soon as the necessary alterations can be made to adapt the premises for the successful carrying out of an important development contemplated. In addition to the firm's existing machinery, the whole of which will be removed to the South Shore works, a quantity of new machinery of the latest and most effective description will be put down. The intention is to make the place thoroughly up to date in all respects, so that the firm will be able to enlarge their scope of operations, particularly in the manufacture of tanks, ventilators, and sheet work of all kinds. The offices and sales department will be continued as heretofore at 27 and 29, Side.

Mr. W. F. Snowdon is introducing a new means for covering steam boilers with non-conducting composition in sections. The arrangement is both simple and effective, and cannot fail to commend itself wherever it is seen. In future it will be possible to "touch the spot" in a leaking boiler without displacing a considerable amount of covering, and this alone will prove an advantage of no small importance to owners and persons in charge.

The manufacturers of the well known Zynkara Composition, for preventing corrosion in steam boilers, are again extending their premises in Pipewellgate, Gateshead. It is now several years since the firm began to put this article on the market, and it has been received with such favour that they have been under the necessity, from time to time, of increasing their resources for production. When the present extensions are completed, the productive capacity will, it is hoped, be large enough to meet any demand that may arise. The demand for this article, both by home and foreign users, has been steadily growing from the first, and is still growing. By the arrangements now made, however, the proprietors have every confidence in being able to supply the requirements of customers—both new and old—in whatever part of the world they may be located.

THE WEAR.

Shipbuilding.—Messrs. Short Brothers, Messrs. J. L. Thompson & Sons, Messrs. Priestman, Messrs Pickersgill, and Messrs. R. Thompson & Sons, are all understood to have booked orders lately, and in each case preparations for laying down vessels are being made. Mr. Laing has also added to his order book, and two keels have just been placed in his east yard. There is a report current that this builder has secured an order for a vessel considerably larger than that ordered by the Anglo-American Oil Co., which will have a capacity of 11,000 tons; but we have not been able to verify the statement, and can only hope it is correct At the time of writing, a new type of vessel, of large size, is being prepared for launching. Special advantages are claimed for the design in accordance with which this vessel has been constructed, and it is also remarkable as being the first joggle-plated ship that has been launched from Mr. Laing's yard.

Messrs. Doxford are keeping very busy, and have some extremely heavy stern frames in course of manufacture at a local forge. An exceptionally fine building, comprising suites of commercial offices, drawing, offices, reception rooms, &c., which was commenced by the firm early in the year, is now about completed, and will shortly be ready for occupation.

Messrs. Short Brothers, are, it is said, preparing to put down one or two large vessels in the recently acquired North of England yard. The firm are at present fitting out a vessel at the Quay.

The Sunderland Shipbuilding Co. have two or three small vessels to build, beside two now on the stocks, and Messrs. Bartram & Sons have also a couple to put down in addition to the vessels now in progress. In the latter case, however, the vessels are of large size. It is reported that Messrs. John Blumer & Co. have, among other contracts, an order for a vessel similar in size and design to the s.s. *Donna Amelia*, built by them for a Portuguese firm, earlier in the year.

Engineering.—There is a little to be said in reference to the marine engine works on the Wear, excepting that all are busy, and that in every case night work is being resorted to. Besides new work, there is a considerable amount of repair work going on, the Palmer's Hill establishment (Messrs. John Dickinson & Sons) perhaps, having the most in this line. The crank shafts manufactured by the latter firm, continue to be in great request, and the number turned out each month is steadily increasing.

Messrs. John Lynn & Co., of the St. Luke's Engine Works Pallion, having resolved upon an extensive development of their business as engineers, &c., have acquired possession of a large building in the vicinity of their works, which though now unoccupied, was formerly utilized in the manufacture of ship and engine forgings. It was indeed, specially built for that purpose, and is therefore substantial in construction and large in extent. The new proprietors have already commenced to carry out the necessary alterations to make the place suitable for the purposes they have in view, one of which is to ca iron founding in connection with their engineering business. This is the second extension entered upon within a few years by Messrs. Lynn, and though this is an exceptionally important step in the direction of further development, it is not for a moment to be supposed that it will be the last to be taken.

Messrs. Wm. Mills, of the "Atlas" works, Sunderland, has been very successful in aluminium casting, and has now a large order in hand from a Coventry firm in connection with the manufacture of motor cycles. The appearance of the aluminium castings made at these works is most attractive, while their lightness is phenomenal; indeed we cannot but think that in the near future there will be a greatly-extended application for this very useful metal.

The whole of the local forges have become busy within the past week or two, and in one or two instances the pressure of work is far beyond the ordinary. Foundries are also much better employed, and rolling mills are working full time.

The Wear Commissioners' graving docks have been constantly in use throughout the month.

The Hartlepools.—It is reported that Messrs. Wm. Gray & Co. have booked, in the course of a few days, orders for more than a dozen large steamers, and that both Messrs. Furness & Withy, and Messrs. Irvine have also added considerably to the amount of work in hand. We cannot vouch for the truth of what is said, but it is not at all improbable that Messrs. Gray have booked largely, for the enterprise of the firm is well known. It is also stated that Messrs. Richardson have booked, since the beginning of the month, orders for engines amounting to some 15,000 I.H.P. Neither is this statement improbable, for in this case also enterprise as well as reputation are factors of importance in securing work. Assuming that the report respecting the orders at Messrs. Gray's yard is correct, business at the Central Engine Works is bound to undergo an immediate and a big change for the better.

Stockton.—Messrs. Ropner launched on the 21st inst. the first example of a new type of steamer which the firm are introducing. It is called the "Trunk" type, and is described as a self-trimmer. It is stated that Messrs. Ropner have orders for other vessels of this type from owners on the Thames and on the Clyde. Messrs. Blair & Co. are understood to have added largely to their prospective work account, and are now exceedingly busy. Messrs. Riley Brothers, boilermakers, &c., are also greatly pressed with orders.

Middlesbro'.—Messrs. Raylton Dixon & Co. are sharing largely in the general increase of work that is now going on, and Messrs. Craggs are also getting busier. Messrs. Bolckow Vaughan have recently booked an order for 20,000 tons of rails and fish plates for the Indian railways. The firm have received several other important orders for railway material, and their works at Eston will now be kept going full throughout the winter.

Darlington.—The Darlington Forge Co. have received an order to supply the hollow crank shaft and the hollow screw shafting for the engines of the first-class battleship *Canopus*, which are being fitted by the Greenock Foundry Co. The twin-screw shafts will weigh about 36 tons each. The Forge Co. have also the contracts for the crank shafts and straight shafting required for two Cunard liners now building on the Clyde.

THE MERSEY.

(*From our own Correspondent.*)

THROUGHOUT all branches of the engineering trade the outlook continues very satisfactory, the improvement recently reported being fully maintained, and not only are all branches of industry well supplied with orders, but new work is coming forward in sufficient quantity to maintain the present activity for some time to come. The marine engineering branches are well off for work, both as regards shipbuilding on the Birkenhead side of the Mersey, and heavy marine tool work in the hands of leading engineers in the Manchester district. In the boiler-making trade all the principal firms are kept busily engaged on orders coming to hand; the stationary engine building trade also continues well supplied with work, and generally in all departments the order books of the leading establishments are full, at any rate, for the remainder of the present year. The only element in the present situation which is not satisfactory is the continued advance in the cost of production both as as regards material and wages. In the Manchester district the wages dispute has been settled by practically a full concession of the demand for a 2s. per week advance. After the receipt of the second reply of the employers,—the text of which was given last month,—the joint committee representing the workmen's trades union societies took a ballot of the members as to whether, in case the employers did not concede the 2s. advance by the 3rd October, the men should be withdrawn from the shops on that date. The men, by an overwhelming majority, decided upon the above course of action, and a strike seemed almost inevitable, but, as a result of hurried negotiations between the employers' association and the workmen's joint committee, a meeting between representatives of each side was held on the 1st October, when several proposals for a settlement were put forward. These proposals were brought before a general meeting of the employers on the following day, when it was decided, although not without strong opposition on the part of some of the largest firms, to offer a compromise by granting a 1s. advance at once, and another 1s. in January. These terms were accepted by the workmen's joint committee, and confirmed by a ballot by the workmen themselves. The moulder's demand for a 2s. advance was also settled on the same basis. The threatened strike was thus averted, but the compromise, although regarded as a very satisfactory settlement by the workmen, was looked upon by many of the leading firms with anything but favour, their opinion being that the men have been far too precipitate in their demand, and it is stated that the compromise was agreed to by the employers as the only possible way in which to avert a labour struggle which would have proved most ruinous to the engineering trades of the district. The wages movement has since extended throughout East Lancashire, and generally the demands put forward by the men have met with very little real resistance. At Blackburn, however, the employers have made a stubborn stand, and the result has been that, after a comparatively short struggle, and only a partial strike, the trades union officials have preferred to submit the dispute to arbitration on condition that all the men should be reinstated and the arbitration preceedings completed by the end of November. The employers have agreed to this proposal, and, considering the strong objection which the trades union officials usually have to submit the demands they put forward to arbitration, they have certainly gained an important point, which may have some influence on the settlement of disputes in other districts. With regard to the Manchester dispute, the reasons put forward by the masters against any general rise in wages at present certainly afforded sufficient grounds for submitting the whole question to arbitration, as has been done at Blackburn, but the men, no doubt, knowing the want of unity amongst the masters, adopted such an unbending attitude that the employers were compelled to concede practically the whole of the workmen's request, and a very sore feeling prevails in consequence.

The usual monthly returns of the principal engineering trades unions are again of a satisfactory character, but the number of unemployed members on the books has shown a small increase, owing to wages disputes in various districts brought about by the remarkable activity in trade. The Amalgamated Society of Engineers has now $2\frac{1}{2}$ per cent. of the total membership on support, but in this immediate district the actual number of unemployed at the time when the returns were made up could scarcely be accurately given, owing to the unsettlement following on the Manchester wages dispute. The Steam Engine Maker's Society has now $1\frac{3}{4}$ per cent. on donation—an increase of $\frac{3}{4}$ per cent. on last month. Reports as to trade continue very favourable, marine centres being generally returned as exceptionally well employed, and the improvement in many branches of engineering industry has enabled the men to successfully enforce demands for advances in wages.

Messrs. Laird Brothers, of Birkenhead, are well engaged in executing orders on their books, and during the month have had some very satisfactory trials with torpedo-boat destroyers, which they have built for the British and Chilian Governments. At the commencement of the month they took out on the Clyde the *Capitan Orella*, one of the fleet for the Chilian navy, and the mean speed obtained on six runs over the Skelmorlie mile was 30·17 knots, with 361 revolutions, the average revolutions for three hours' continuous running being 362·5, giving a rather higher speed, whilst the vessel throughout the trials proved a very steady sea-boat. On the 15th inst. the official full-speed trials of the *Capitan Munez Gamero* were taken, the mean speed on the measured mile being 30·42 knots, with 369 revolutions, with a speed during the three hours' continuous steaming of over 30 knots, the mean revolutions being 364. The most successful trial, however, was that of the *Sparrowhawk*, the first of the destroyers Messrs. Laird have built for the English Admiralty. The mean speed on six runs on the Clyde was 30·2 knots, with 364 revolutions, and the speed for the three hours' continuous steaming was 30·56 knots, which is the highest yet recorded with any vessel ever built, and was obtained with the full load on board under the usual Admiralty conditions. The firm, however, are not resting satisfied with this remarkably high speed, but are building another destroyer for the Government to run at 33 knots, with 240 lbs. boiler pressure, not less than 400 revolutions, and developing between 9,000 to 10,000 H.P.

Mr. Jackson, lamp manufacturer, Shepley Street, London Road, Manchester, is introducing a new patented hurricane-lantern, made on the central draught principle, and which is especially useful for dock's requirements, and also for ship-deck purposes. This lamp is exceptionally strong in every part, all tubes being seamless, whilst the fount or container is of ample capacity. The most noticeable feature, however, is that instead of being arranged with the hinge-over device used in many hurricane lanterns, the glass can be lifted up from the top, so that the lamp can be readily cleaned or trimmed. No special chimney is required, and the lantern is finished in bright tin or japanned red. A pure and steady light, absolutely wind-proof, is given off, a number of tests having been applied with very satisfactory results.

The Lancashire and Cheshire Opalite Glazed Brick and Tile Co., John Dalton Street, Manchester, have secured an extensive order for their opalite bricks and tiles for the Liverpool cold-air air stores, where they are fitting upwards of 3,000 yards in various parts of the building. The new City of London Railway are also adopting opalite for the subways at their passenger stations, and the Liverpool, Manchester, and Stockport corporations have specified it for their underground conveniences.

In the iron trade a considerable business has been coming forward, with an exceedingly strong tone as regards prices, which both in raw and finished material have shown a steady upward move. In pig-iron there has been a general advance of 1s. to 2s. per ton, and makers hold firmly to full rates, with very little underselling going on. Local brands have been put up 6d. per ton, quotations being now 44s. 6d., less 2½ for forge, delivered Warrington, and 47s. for foundry, delivered Manchester. Lincolnshire makers have advanced foundry qualities to 44s. 6d. net cash, and are indifferent about booking further orders on this basis, with forge brands firm at 43s. 6d. net cash, delivered Manchester. Derbyshire in some brands has been advanced 1s. 6d. per ton, 47s. 9d. net being now quoted for one of the leading makes, delivered here. Outside brands have shown a substantial upward move, owing to some extent to the rise in freights, and good foundry Middlesbrough could scarcely be bought under 48s. 4d. net cash, delivered by rail Manchester, with 46s. 6d. to 47s. quoted for delivery Manchester Dock Quays, whilst Scotch iron now averages 48s. for Eglinton, and 47s. 9d. for Glengarnock, net prompt cash, delivered Lancashire ports, with 2s. to 2s. 3d. more for delivery Manchester docks.

In finished iron a satisfactory business comes forward, and prices, with the exception of sheets, have shown a hardening tendency. Lancashire bars are now quoted £5 12s. 6d. on inland sales, with £5 15s. becoming more nearly the average for shipment, and North Staffordshire makers are now quoting £5 15s. as the minimum. Sheets are rather weaker, and obtainable at £7 2s. 6d. to £7 7s. 6d., but hoops have been put up 2s. 6d. per ton, list rates being now £6 5s. for random, to £6 10s. for special cut lengths delivered Manchester district, and 2s. 6d. less for shipment.

The position in the steel trade is also stronger, with better prices obtainable. Good foundry hematites are not quoted under 57s. 6d. less 2½, and for steel billets, local makers, who are well sold, and unable to book orders for early delivery, are now quoting £5 net cash delivered here. Bars are firm at £6, and boiler plates at £6 5s., with a tendency to advance on this figure.

In the metal market orders come to hand freely, and manufacturers are all well engaged, with prices firm at list rates, which for delivery Manchester district are as follows:—Solid-drawn brass boiler tubes, 7d.; brass surface condenser tubes, 8½d.; copper tubes, 8½d.; brazed copper gas and steam tubes, 8½d.; brass gas tube, 7½d.; brass wire, 6d.; copper wire, 7d.; rolled brass, 5½d. and sheet brass 6½d. per lb.

The coal trade shows a gradual revival of activity, and pits are getting on to better time, four to five days per week being the average, with many of them on full time work. House coals especially are meeting with more enquiry, owing to the approach of winter, and prices show a hardening tendency, but there is no actual advance beyond a levelling up to list rates, where prices have previously been cut exceptionally low. Steam and forge coals also move away more freely, but supplies continue in excess of requirements, and prices low. Engine fuel, so far as the better qualities are concerned, meets with a good demand, and on forward contracts advanced prices are being obtained, but common slack shows no improvement, and can be bought at very low prices. At the pit mouth best house coals average 10s. to 10s. 6d.; Pemberton four foot and seconds Arley, 8s. to 8s. 6d.; common house coal, to 7s. to 7s. 6d.; steam and forge coals, 6s. to 6s. 6d.; best slack, 4s. 3d. to 4s. 9d.; and common sorts 3s. to 3s. 6d.

The shipping trade, which has been somewhat interfered with by the recent storms, is now fairly active, but prices are as low as ever, ordinary steam coal delivered Mersey ports or Manchester Ship Canal still averaging about 7s. per ton.

In the timber trade business is quiet, and imports have been ample, but deliveries have been fairly satisfactory. Prices show little change, but more moderate supplies are needful to maintain a steady market. In East India teak the market is steady, with stocks moderate. There has been no import of greenheart, and with a fair demand and reduced stock, the position is stronger.

BELFAST TRADE NOTES.

(*From our own Correspondent.*)

NO material change can be noticed in the shipbuilding and engineering trades as regards Belfast. Both the principal firms continue to be kept busy, and no sooner does a slip become vacant, than the keel blocks are immediately laid for a new vessel. At present Messrs. Harland & Wolff are engaged in constructing a coffer-dam across the end of one of their longest slips in the North yard, so that work may be carried on at any state of the tide. Extensive piling operations are also being carried on at the same slip. These preparations are being made prior to commencing to build a new first class twin-screw steamer for the White Star Co. It is rumoured that the vessel will be 685 ft. long by 72 ft. beam, and be fitted up in a style far surpassing that of the *Teutonic* and *Majestic*, the well known "greyhounds," from the same yard. The dimensions given may prove slightly inaccurate, but there is no doubt that the vessel will be of exceptional size, even in these days of "leviathans."

Messrs. Harland & Wolff are also credited with having booked the following extensive orders recently, in addition to the above, viz.:—A steamer for the Union Steamship Co. for service between Southampton and the Cape. The vessel will be somewhat on the lines of the *Norman*, built here a few years ago, and the *Scot*, recently lengthened here, and which has given so much satisfaction since; a 500 ft. cargo boat for the White Star Line; a first-class passenger steamer for Messrs. Bibby & Co., Liverpool, intended to ply between London, Liverpool and Rangoon; a steamer for the Pacific Steam Navigation Co.; and an order to lengthen by 80 ft. the s.s. *Augusta Victoria*, of the Hamburg-American Line. These orders with those already in hand should keep even this vast establishment busy for a considerable time to come.

The firm's exceptionally clean record has been somewhat marred during the month by two unfortunate accidents, for which the weather, however, was entirely to blame. The first of these happened to the t.s.s. *Comic*, while backing out of the Abercorn basin, preparatory to going on her trial trip. At the time this was being done, a very violent gale of wind was blowing, which drove the stern of the vessel against the quay wall with such force that her cast-steel rudder was smashed and the stern-post broken in three places. The *Comic* was immediately docked and the broken stern-post removed, but she will be delayed for nearly a month pending the casting of a new one. The accident was particularly unfortunate, as all arrangements had been made for a pleasant cruise round to Londonderry, and a large company of gentlemen, including Mr. G. W. Wolff, M.P., had been invited.

The second accident referred to occurred during the launching of the s.s. *Arcadia*, one of the new steamers of similar dimensions, for the Hamburg-American Co. The vessel was successfully put into the water, but the heavy gale prevailing at the time, drove her stern first across the river, the tugs being powerless to hold her. She collided with and severely damaged a steamer named the *City of Belfast*, at the same time breaking one of her propeller blades and bending the others, while the stern also sustained considerable damage. Both these accidents serve to point out the necessity there is for a powerful tug in the harbour, and should hasten the completion of the one ordered from Messrs. Maccoll & Co., Limited. Messrs. Workman, Clark & Co. were down for a launch on the same day as that on which the *Arcadia* came off, but considering, no doubt, that discretion was the better part of valour, postponed the event.

The twin-screw steamer *Gascon*, for the White Star line, launched last month, was joined during this month by the second of her class, viz., the *Gaika*. It is unnecessary to repeat her dimensions, which are entirely similar to those of the *Gascon*.

The s.s. *Magician*, built by the same firm for Messrs. T. & J. Harrison, Liverpool, is expected to run her trial trip before the end of the month. Messrs. Workman, Clark & Co. have also completed and successfully delivered the new caisson for the new Portsmouth Dockyard. The work of rebuilding the engine shops of this firm is being steadily carried on, but a large amount of work remains to be done yet before work can be resumed. It is said the firm intend using electricity as their motive-power throughout; in fact, a trial has been already made in their South yard, which proved eminently satisfactory. The results of this experiment will be watched with interest.

The Irish Shipowners' Co., whose headquarters are at Belfast, have just purchased at Liverpool the s s. *Algoma*. The purchase price is stated to have been £15,000.

NORTH-WEST OF ENGLAND.

(*From our own Correspondent.*)

Barrow.—The shipbuilding trade of this district maintains its *statu quo*. The yards are briskly employed, and have good prospects of continued activity. There is only one disappointing feature in the present prospect, and that is the scarcity of commercial orders. Apart from three high-speed Channel steamers, there is no other commercial work in hand, save and except a few repair jobs which are engaging attention. The main features of the work in hand are Admiralty orders, and these are keeping nearly all departments very busily employed, but it would be a more satisfactory state of things if more commercial work could be secured, and the Barrow yard is certainly well adapted for the carrying on of this class of work. During the month H.M.S. *Avon*, one of the four torpedo-boat destroyers building at Barrow, was launched, and is now receiving her engines and fittings. Her sister ship, the *Bittern*, will be launched during November, and soon afterwards the *Otto* and the *Leopard* will be put into the water. Craft like these make the engineering department very busy, as there is a lot of delicate work to do, and, although the engines represent comparatively small weight, they certainly require all the greater care, because of the high power they have to develop up to. The Barrow and Belfast steamer, the *Duchess of Devonshire*, twin-screw, is fully plated, and will be launched this year. The plating of the two Great Western twin-screw Channel steamers have just been commenced, and they will be launched early in next year. It is expected H.M.S. *Niobe*, first-class cruiser, will be launched before Christmas. A sister ship, the *Amphitrite*, also for the Admiralty, is being put down on the stocks alongside the *Niobe*, and she will soon begin to rear her sides, as the keel-plates are already being laid. During the month the Naval Construction and Armaments Co. received an order from Messrs. Cayzer, Irvine & Co. to triple three of their steamers, now engaged in the East India trade, the *Clan McKenzie*, *Clan McGregor*, and *Clan Buchanan*. At present this company is tripling the *Clan Sinclair* for the same owners. About nine of this company's steamers have during recent years been tripled at Barrow, and in every case the result has been highly satisfactory and decidedly economic. The second-class cruiser *Doris* has been delivered during the month to the Admiralty, and made a capital trial spin round to Devonport. Her sister ship, the *Juno*, also built at Barrow, is at present running her trials, which promise to be very satisfactory. Much interest has naturally been centred locally in the trials of H.M.S. *Powerful*, which have been a brilliant success. She has only a final trial of four hours at 25,000 I.H.P. and four hours at 18,000 I.H.P., and then she will be handed over to the Admiralty. The success of the Belleville boilers as quick steam generators is already assured, and in the case of the *Powerful* it is shown how very satisfactorily they work and how completely they can be depended upon for plenty of steam when full power demands are made upon them. The great secret of the success of the Belleville boilers is found in scientific stoking, and any failures which have arisen up to now have not been the fault of the boilers themselves, but the want of a perfect knowledge how to stoke them. This difficulty will be overcome in time by experience.

Whitehaven.—There is much correspondence in the local newspapers at present with regard to the restarting of the old shipyard at Whitehaven, but nobody seems to have heart enough to tackle the question on practical lines. There is a feeling that the last company was badly managed, and that profits could have been made on the ships built if those directing affairs had had any capacity. Lord Lonsdale is Mayor of Whitehaven, and he some time ago purchased the old shipyard at a very low price, with the view, it is said, of being able to offer facilities to anyone wishing to resuscitate this industry; but up to now nothing has come of it, and it is now proposed to call a meeting of townsmen together in order that those willing to invest their capital in the undertaking may come forward and thus induce Lord Lonsdale himself to take an interest in the resuscitation of a concern which is likely to be of great advantage to the trade of the town and port. In other parts of Cumberland, shipbuilding is carried on very satisfactorily and profitably, and it is felt that Whitehaven would be equally successful if the yard could be re-opened and men found capable of managing it.

Workington and Maryport.—A good and steady trade is still being done in the shipbuilding industries of Workington and Maryport. Orders are plentiful for the small class of craft built at these ports, and a fair margin of profit is afforded to the builders. It is confidently believed that, as the work in hand is completed, new orders will be secured, and the regularity of activity maintained.

Shipbuilding Material.—There is a steady demand for all classes of shipbuilding material, and this is much more apparent on general than on local account. Some good contracts have been fixed during the month for heavy steel plates for Glasgow, Belfast and Liverpool, and makers are more fully sold forward than they have been for some time past. It is quite evident that the activity which for some time past has characterised the steel trade will be maintained for fully twelve months to come at least, inasmuch as orders are already held for fully nine months' work, and the sources of demand are all full of life and likely to afford plenty of trade for a considerable period. A good demand has set in for light plates, and there is an especially brisk business in heavy steel castings required by engineers and shipbuilders. It is evident this department of local trade will soon have to be considerably increased, as the demand is greater than the capacity of supply, and Barrow is admirably situated for the profitable working of this trade.

Hematites.—The trade in hematite pig-iron is growing more and more active, and the demand for Bessemer descriptions is briskly maintained. Prices during the month have improved and makers are now doing business in parcels of mixed Bessemer numbers at 50s. 6d. per ton, net, f.o.b. The business doing in warrant-iron has been considerable, with the result that stocks have been very considerably reduced during the month, and now stand at under 300,000 tons. They are still, however, 6,000 to 8,000 tons higher than at the beginning of the year.

Shipping.—Shipping during the month has only been indifferently employed as to a great extent shipping operations have been retarded by the storms. Considerable shipments, however, have to be made, and the statistics up to the present show a great increase in tonnage exports as compared with last year.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—ENGLISH.

Gloxinia.—On September 7th the *Gloxinia*, a steel steam ketch of about 145 tons, was launched at North Shields, owned by the Southern S. Tel. Co., Milford.

Fuchsia.—On September 7th the *Fuchsia*, a steel steam ketch of about 145 tons, was launched at North Shields, owned by the Southern S. Tel. Co., Milford.

Sapphire.—On September 9th the *Sapphire*, a steel sailing schooner of about 236 tons, was launched at Middlesbrough, owned by Messrs. W. Cory & Sons, of London.

Jasper.—On September 9th the *Jasper*, a steel sailing schooner of about 236 tons, was launched at Middlesbrough, owned by Messrs. W. Cory & Sons, of London.

Marie Louise.—On September 10th the *Marie Louise*, an iron steam ketch of about 150 tons, was launched at Beverley, owned by the Soc. Anon. Pecheries á Vap., Ostend.

Emerald.—On September 12th the *Emerald*, a steel sailing schooner of about 236 tons, was launched at Middlesbrough, owned by Messrs. W. Cory & Sons, of London.

Sea-going Barge.—On September 18th Messrs. R. Craggs & Sons launched at Middlesbrough a powerful sea-going barge, built to the order of J. Constant, Esq., London. Her dimensions are as follows:—125 ft. by 25 ft. by 8 ft. 9 in. moulded.

Batoum.—On September 21st the *Batoum*, a steel steam schooner of about 1,328 tons, was launched at Sunderland, owned by the Azof Steam Navigation Co., of Odessa.

Iron Lighter.—On September 22nd Mr. J. Scarr, Beverley, launched an iron lighter for Messrs. T. Wilson, Sons & Co., Limited, of Hull. The general dimensions of the vessel are:—Length, extreme, 70 ft. by 17 ft. 6 in. moulded beam by 8 ft. 6 in. moulded depth. Her total carrying capacity is 180 tons.

Kirkfield.—On September 22nd Messrs. Bartram & Sons launched from their shipbuilding yard at Sunderland a large and beautifully-modelled steel screw steamer for Messrs. James R. Cuthbertson & Co., Glasgow. The vessel is of the spar-deck type, with poop, long bridge, and topgallant forecastle, and is of the following dimensions:—Length, 344 ft.; breadth, 45 ft.; depth, 28 ft. 9 in., and will carry a large cargo on a moderate draught of water. She has been built to the highest class in Lloyd's Registry, and under the supervision of Mr. James MacEwen, of Greenock, on behalf of the owners. There are six steel bulkheads, and the double bottom, which is on the cellular principle, will contain an extra large quantity of water ballast. There are no hold beams, and the holds are particularly clear of obstructions and suitable for general cargoes. The decks are of extra thickness to guard against corrosion, and the vessel is in many respects built in excess of Lloyd's requirements. The engines will be supplied by Messrs. John Dickinson & Sons, Limited, Monkwearmouth, the cylinders being 24½ in., 40 in. and 66 in., by 45 in. stroke. The boilers are of extra-large size, and will be fitted with Howden's system of forced draught, the working steam pressure being 160 lbs. In addition to the usual machinery, the engines will be fitted with steam-turning engine, steam ash-hoist. Weir's patent pumps, Morison's evaporator, Weir's filter, and Kirkaldy's feedheater. During construction the engines have been surveyed by Mr. M'Kechnie, of Glasgow, on behalf of the owners, and they have also been built to comply with the Board of Trade requirements to obtain their certificate. As the vessel left the ways she was gracefully christened *Kirkfield* by Mrs. M'Arthur Cuthbertson. Among the visitors were Mr. James Cuthbertson, Mr. George Cuthbertson, Mr. R. A. Bartram, Mr. and Mrs. George Bartram, Mr. W. N. Bartram, Miss Bartram, Mr. Fred Dickinson, Captain Leask, dock-master; Mr. James MacEwen, and Captain Sutherland, who will command the vessel.

Sunningdale.—On September 23rd Messrs. Ropner & Son launched at Stockton-on-Tees a steel screw steamer of the following dimensions:—Length between perpendiculars, 300 ft.; breadth, 43 ft.; moulded depth, 19 ft. 8 in. The vessel has been built for Messrs. J. A. Wood & Co., of West Hartlepool. She is built on the part awning-decked rule, with poop and raised quarter-deck, her deadweight carrying capacity being 3,800 tons, on 18 ft. 8 in., and is built on the web-frame principle, leaving the holds entirely clear for cargo, and carries her water ballast in a cellular bottom and in the after peak. She has steam steering gear amidships and screw gear aft, four powerful steam winches, two large donkey boilers, direct steam windlass, stockless anchors, &c. The engines will work up to about 900 effective H.P., and are by Messrs. Thomas Richardson & Sons, Limited, having cylinders 21½ in., 35 in. and 59 in. by 39-in. stroke, steam being supplied by two large steel boilers working at 160 lbs. pressure. As the steamer moved away the name of *Sunningdale* was given to her by Mrs. T. N. Alexander, of Harbour View, South Shields.

Cornwall.—On September 23rd Messrs. R. & W. Hawthorn, Leslie & Co., Limited, launched at Hebburn-on-Tyne, a large steamer of the following dimensions:—435 ft. by 54 ft., by 32 ft. She is built to the order of Messrs. William Milburn & Co., of London, for the Federal Steam Navigation Co., is for the Australian trade, and is specially fitted for carrying frozen meat. She is classed at Lloyd's 100 A1, three decks. The machinery, which is being constructed by the same firm at their St. Peter's Works, consists of a set of triple-expansion engines, capable of indicating upwards of 3,000 H.P., with three large single-ended steel boilers, working at a pressure of 160 lbs. per square inch. The vessel was named *Cornwall*.

Barnsley.—On September 24th the *Barnsley*, an iron steam ketch, of about 143 tons, was launched at Howden, owned by Messrs. Hagerup, Doughty & Co., Grimsby.

Ashton.—On September 24th the *Ashton*, an iron steam ketch, of about 143 tons, was launched at Howden, owned by Messrs. Hagerup, Doughty & Co., Grimsby.

Gunhild.—On September 25th Messrs. R. Craggs & Sons launched at Middlesbrough-on-Tees a steel screw steamer built to the order of Mr. Sigurd Hedberg, of Malmo. She will take Lloyd's highest class, and is of the well-deck type. Her dimensions are as follows:—Length, 265 ft. over all; 37 ft. beam; 17 ft. 9 in. depth, moulded. Her engines, which are of the triple-expansion type, are being fitted by Messrs. Sir Christopher Furness, Westgarth & Co., Limited, and have cylinders 19 in., 31½ in., and 52 in. by 36 in. stroke, with a working pressure of 160 lbs. As the vessel left the ways she was christened by Miss Gunhild Hedberg the *Gunhild*.

Councillor.—On September 26th the *Councillor*, an iron steam ketch of about 163 tons, was launched at Hull, owned by R. Simpson & Co., Limited.

Ville de Cette.—On September 26th the *Ville de Cette*, a steel steam schooner of about 1,800 tons, was launched at South Shields, owned by Cie. Gen. de Nord. Dunkirk.

Clan Sutherland.—On Saturday, September 26th, the Naval Construction and Armaments Co., Limited, launched from their yard at Barrow-in-Furness the steel-screw steamer *Clan Sutherland*, built to the order of the Clan Line of steamers of Glasgow. The vessel, which received its name at the hands of Lady Moyra Cavendish, is somewhat larger than the five which the Barrow company have already built for the Clan Line. Her chief dimensions are:—Length between perpendiculars, 326 ft.; moulded breadth, 40 ft.; moulded depth, 26 ft. 2 in.; gross tonnage, 2,830. She is built to the requirements of Lloyd's for their highest class under special survey.

White Cross.—On October 3rd Messrs. Edwin Clark & Co., at Canal Side, Brimscombe, near Gloucester, launched a new steam launch for the ambulance service of the Metropolitan Asylums Board. The general description is as follows:—Length, between perpendiculars, 65 ft.; breadth, 12 ft. 6 in.; depth, 4 ft. 6 in.; mean draught of water when fully equipped, 2 ft. 7 in. She is divided into six compartments by five steel watertight bulkheads, and the hull is constructed of Siemens-Martin steel throughout. The machinery is placed amidships, and has been constructed by Messrs. Sissons & Co., of Gloucester. The engines are of the three-crank type, and the cylinders are 6 in., 9 in. and 15 in. diameter respectively, with a 10-in. stroke, and are sufficient to develop 100 I.H.P. when running at full speed. The launch was named the *White Cross*.

Steel Screw Steamer.—On October 6th Sir Raylton Dixon & Co. launched from their Cleveland dockyards, Middlesbrough, a very handsome screw steamer, built on their own account, 320 ft. by 43 ft. 3 in. by 25 ft. moulded. The vessel is of the spar deck type, with poop, bridge and forecastle, classed 100 A1 at Lloyd's, and has a deadweight capacity of about 4,250
on 20 ft. draught of water. The accom
officers and engineers is in hous

topgallant forecastle. The engines, by Messrs. The North-Eastern Marine Engineering Co., Limited, Wallsend, are of the triple-expansion type, having cylinders 23 in., 36 in., 59 in. by 42 in. stroke, and supplied with steam by two large single-ended boilers working at 180 lbs. pressure, and fitted with Howden's system of forced draught, duplicate fan engine and other improvements.

Port Denison.—On Tuesday, October 6th, there was launched from the yard of the Tyne Iron Shipbuilding Co., Limited, of Willington Quay-on-Tyne, a steel screw steamer, built to the order of Messrs. Wm. Milburn & Co., of Newcastle-on-Tyne and London, of the following dimensions, viz.:—Length, 345 ft.; breadth, 46 ft.; depth, 27 ft. 2 in. moulded, and to class 100 A1 at Lloyd's on the spar decked rule. This vessel has water ballast fitted right fore and aft on the cellular system and is also fitted with all modern improvements for the rapid loading and discharging of cargo, including seven double cylindered steam winches, direct acting steam windlass, large donkey boiler, steam steering gear by Messrs. Donkin & Co., and Hastie's screw gear aft. The engines, which are to be supplied by Messrs. John Dickinson & Sons, Limited, of Sunderland, are of the triple-expansion type, having cylinders 24 in., 40 in., and 64 in. by 45 in. stroke, and working at a pressure of 180 lbs. On leaving the ways the vessel was named the *Port Denison* by Miss Riddle, of Telton Park, Northumberland.

Scottish King.—On October 7th Messrs. Short Brothers launched at Pallion, Sunderland, a steel screw steamer, built to the order of Messrs. Thomas Ronaldson & Co., of London, for their special trade between Antwerp and America. The vessel is of the following dimensions:—Length, 364 ft.; breadth, 43 ft.; and depth, moulded, 29 ft. She has been constructed of Siemens-Martin steel, under special survey, to the highest class in Lloyd's registry. Triple-expansion engines will be fitted by Messrs. Thomas Richardson & Sons, Limited, of Hartlepool, having cylinders 27 in., 43 in., and 72 in. respectively, with a stroke of 48 in., steam being supplied at 180 lbs. working pressure by two large steel boilers, fitted with Howden's system of forced draught. On leaving the ways the vessel was named *Scottish King*, the ceremony being performed by Mrs. Ronaldson, wife of the managing owner. During construction the vessel and engines have been under the supervision of Mr. George M'Farlane, of Glasgow, on behalf of the owners, and when completed she will be under the command of Captain James, who for the past four years has commanded the *Norse King*.

Penguin.—On October 7th the *Penguin*, a steel steam-tug, was launched at Falmouth, owned by Messrs. Rowe Brothers, Falmouth.

Vera.—On October 8th the *Vera*, an iron ketch-rigged steamer, was launched at Beverley, owned by the Atlas Steam Fishing Co., Limited, Grimsby.

Steel Screw Steamer.—On October 8th Messrs. The Blyth Shipbuilding Co., Limited, launched from their shipbuilding and repairing works at Blyth a large steel screw steamer to carry about 5,000 tons on a light draught of water. The principal dimensions of the vessel are:—Length, 325 ft.; breadth, 87 ft.; depth, 22½ ft.; with poop for cabins, bridge amidships, under which the engineers' cabins will be fitted, and topgallant forecastle for crew. The vessel is classed at Lloyd's, and is built principally of steel on the three-deck principle with single deck laid and web frames, but no hold beams, thus giving a very large area in the holds for stowing cargoes of the bulkiest description. The engines will be fitted by Messrs. Blair & Co., of Stockton-on-Tees, and are of the triple-expansion type of large power, and fitted with all their latest improvements for the easy working of machinery, and economy in fuel. As the vessel left the ways the christening ceremony was gracefully performed by Miss Olive Bartlett, of Dartmouth. The hull and engines have been built under the superintendence of Mr. Cowen Landreth, consulting engineer, of Newcastle-on-Tyne.

Lavinia.—On October 8th the new steamer *Lavinia* was launched by Messrs. J. L. Thompson & Sons, Limited, at Sunderland. She has been built to the order of the Hamburg Pacific Dampfschiffs-Linie, Hamburg. Her principal dimensions are:—Length between perpendiculars, 382 ft.; breadth, extreme, 48 ft. 2 in.; depth, moulded, 29 ft. 6 in. The vessel is designed to have a deadweight capacity of over 6,500 tons. She is built to Lloyd's highest class under their special survey, on the three-deck rules. The upper and main decks being laid complete, and the lower deck in the forward holds. The poop and bridge are joined, making a long full poop extending from the stern to the after end of the main hatch. At the fore end of the bridge is placed accommodation for twelve first-class passengers, with a commodious and handsomely fitted-up saloon, and the usual accommodation for the captain, doctor, steward, dispensary, bath-room, &c. The entrance to the saloon and passengers' berths is through a handsomely fitted entrance house on the bridge deck, in front of which is placed the chart-house. On top of this entrance and chart-house is placed the flying bridge. The engineers' and officers' accommodation and mess-room, with steward's berth, bath, &c., is in sidehouses placed at the after-end of the engine casings. The crew, firemen, and petty officers are accommodated in the topgallant forecastle, under which is accommodation for a limited number of emigrants. The usual store-rooms are fitted forward, also a large ice-room. The vessel is built on the cellular double-bottom principle, having six watertight bulkheads, with an iron reserve bunker bulkhead, and an iron longitudinal bulkhead for part of her length. Special attention has been paid to the loading and discharging facilities, and these are of a most complete description. Six powerful steam winches are fitted at the hatches. The other deck fittings consist of a powerful steam windlass, steam steering gear placed at the after-end of the casings, with controlling gear from the captain's bridge. Five boats are provided, three of them being lifeboats. The vessel is rigged as a two-masted fore-and-aft schooner, and is built to a high-class specification. She is fitted with a complete electrical installation, supplied by Messrs. The Sunderland Forge and Engineering Co., Limited. The engines and boilers have been constructed by Messrs. George Clark, Limited, the sizes of the cylinders being 27 in., 44 in., and 72 in., by 48 in. stroke, supplied with steam by three large multitubular boilers, working at 165 lbs. pressure, which are built to meet the requirements of the German law. The vessel was gracefully christened the *Lavinia* and launched by hydraulic power by Madame Lechere, Antwerp. There were also present: Mrs. T. C. Hutchinson, Saltburn; Mr. and Mrs. Robert Thompson, Mr. and Mrs. C. E. Thompson, Miss Forster, Miss Code, London: Miss Darling, Miss Harrison, Whitburn; Mr. Hedworth Williamson, Whitburn Hall; Mrs. Joseph L. Thompson, J.P., Winston-on-Tees; Mr. E. Charlton, Mr. J. H. Charlton, Mr. O. W. Nordin, Paris; Mr. James Marr, Mr. P. Phorson, Captain Weller, representing the owners, and Mr. Thiemann, has superintended the vessel during her construction. After the launch, which was most successful, the company adjourned to the firm's luncheon-room, where the usual toasts were duly honoured.

Cambrian.—On Friday, October 9th, Messrs. William Gray & Co., Limited, West Hartlepool, launched from their central shipyard the steel screw steamship *Cambrian*, the largest and finest ship yet built in the Hartlepools. She has been built to the order of Sir Christopher Furness for the Wilson-Furness-Leyland line of steamers to trade between London and New York. She will take Lloyd's highest class and her length, overall, is 464 ft.; breadth, 49 ft.; depth, 34 ft., and measurement capacity 10,000 tons. A shelter deck is carried over the whole vessel and above that a long bridge deck. Stalls are fitted under these decks to accommodate over 700 head of cattle. The bridge is also available for carrying horses. All the cattle fittings are movable and will stow neatly between the deck beams overhead. A large number of wide vents with revolving cowls will be fitted to supply fresh air to the cattle. In order that cargo may be expeditiously dealt with, seven hatchways are fitted and nine powerful steam winches with extra whipping-drums to work from a large number of derricks. Over the greater portion of her length the vessel is a four-decker. Seven watertight bulkheads are fitted and a cellular double bottom extends throughout, which with the after peak will take over 1,200 tons of water ballast. A steam warping capstan is fitted aft and the powerful steam windlass has special warping drums. The steam and hand steering gear is very strong, and is placed close to the rudder head, straining being avoided by massive springs introduced to ease the shock of seas striking the rudder. Four masts will be fitted with fore-and-aft sails. The saloon and accommodation for passengers will be very tastefully fitted up in the fore part of the bridge, the engineers' and officers' rooms in the after part of the bridge, and berths for a large number of seamen, firemen, cattlemen, &c., on two of the decks forward, and a complete system of electric lighting will be fitted throughout. The strength of the vessel is in excess of Lloyd's requirements, and her construction and equipment will embody everything that the experience of the owners and builders can suggest for her efficiency. The engines are of the triple-expansion type, and are provided by the Central Marine Engine Works of the builders. They are the largest set of engines hitherto built in the Hartlepools, the cylinders being 32 in., 54 in. and 86 in. diameter by 54 in. stroke. They will be supplied by steam at 185 lbs. working pressure by three very large boilers worked on Howden's forced-draught system. The engines have been specially designed for the vessel in view of the fact that she will be continuously engaged in North Atlantic work, all the parts being made exceptionally heavy, and especially the general framework of the engines, the bed-plate, the condenser and the columns. The bed-plate is designed on the plan regularly adopted at the Central Marine Engine Works, namely, with underside made on one level throughout, which system facilitates both the erection of engines on the iron erecting tables at the Central Marine Engine Works, and also the bolting of the engines to the engine seat of the ship at a point immediately beneath the crank shaft in the vertical line of the initial stresses. This bed-plate is of box section throughout, made of great depth to avoid the possibility of yielding under heavy stresses in Atlantic weather, and contains 31 tons of metal. The condenser has been arranged to run fore and aft throughout the whole length of the engine, and made with a horizontal joint at the middle of its height as is usual in all central marine engines. This combination of bed-plate and condenser gives exceptional rigidity to the general structure of the engine, a feature that is further added to by the arrangement of supporting the cylinders in front upon two very massive box section forked cast-iron columns with a large wrought-iron column between them. The crank shaft weighs 20 tons and has its body parts made of the finest ingot steel. It is borne upon six large main bearings placed close to the crank cheeks, which are lined with a high quality of white metal. The connecting rods are 10 ft. 6 in. in length between centres, and are fitted with a very heavy arrangement of double top end which gives unusually large bearing surface. The pistons are made exceptionally deep, and are supplied with Mudd's patent piston packing rings (which have done such good service throughout the past ten years), and the usual very deep junk rings regularly supplied to the central marine engines. The air pump is driven by the main engines. The circulating pump is of the centrifugal type, supplied with a separate driving engine at each side of it. The feeding of the boilers is done by means of a pair of Weir's patent feed pumps, and the supplementary feed is made up by a Mudd's evaporator. There are besides a very large ballast donkey, stand-by feed donkey, cattle donkey and other pumps, and in every way the engine-room will be thoroughly up to the most modern practice. The lubrication of the cylinders will be carried out on a system devised by Mr. J. F. Kitching, superintendent engineer, and the arrangement of short stern-tube is due also to that gentleman. The thrust shaft is of ingot steel and is made with an unusually large bearing surface on its collars, the horseshoe rings being also arranged for water circulation. The thrust and tunnel bearings are all lined with a first-class quality of white metal, and all the bearings throughout the machinery are of great length and all joints are made adjustable. The propeller is fitted with four bronze blades of finest quality, the pitch being differentiated in accordance with the Central Marine Engine Works practice. The engines and boilers are capable of producing about 4,000 I.H P., which will give the ship a speed of about 14 knots. The building of the engines and boilers, and all the accessory machinery has been personally superintended throughout by Mr. J. F. Kitching, the superintendent engineer to Sir Christopher Furness. Captain Manly is also supervising the construction of the ship. The ceremony of christening the *Cambrian* was gracefully performed by Miss Furness, of Tunstall Court, West Hartlepool.

Altai.—On October 10th the new steamer *Altai* was launched by Messrs. Dobson & Co., of Newcastle-on-Tyne, for the Atlas Steamship Co., of Liverpool, to be employed by this company in their line between New York, Jamaica, Central and South America. The dimensions of the *Altai* are 320 ft. between perpendiculars, 39 ft. beam, with a depth of 27 ft, and her gross register tonnage will be 2,600. The engines, which are being constructed by Messrs. J. Dickinson & Sons, Limited, are of the triple type, the cylinders being 26¼ in., 45¼ in., and 75 inches, by 48 in. stroke. Steam is supplied by two boilers, each 15 ft. 9 in. by 11 ft. 3 in., and 180 lbs. pressure, and fitted with Howden's forced draught, and are intended to give an effective H.P. of 2,600. The owners' superintending engineers, Messrs. Wm. Esplen & Sons, have had the oversight of the whole of the work. The vessel as she left the ways was named by Miss Mildred Forwood, daughter of the Right Hon. Sir Arthur B. Forwood, M.P., one of the managing owners.

Venus.—On October 10th the *Venus*, an iron steam ketch, of about 150 tons, was launched at Beverley, owned by the Atlas Steam Fishing Co., Limited, Grimsby.

Comrade.—On October 10th the *Comrade* an iron ketch-rigged steamer, of 150 tons gross, was launched at Hull, owned by Messrs. J. Duncan Son & Co., Hull.

Ekuro.—On October 16th there was launched from the shipbuilding yard of C. S. Swan & Hunter, Limited, Wallsend-on-Tyne, a smartly modelled steamer, built to the order of the British and African Steam Navigation Co., Liverpool, for their African coasting trade. The vessel is built of steel to the company's specification and special requirements, the dimensions being 185 ft. between perpendiculars, by 26 ft. 1 in. breadth, by 12 ft. depth moulded, with flush deck, full poop, with accommodation for a small number of first-class passengers, long bridge amidships, topgallant forecastle, with shelter deck amidships, water ballast being carried in peak tanks. The machinery, which has been constructed by Messrs. J. P. Rennoldson & Sons, of South Shields, consists of a set of compound engines with cylinders 23 in., and 40 in. diameter, by 26 in. stroke, large steel boiler. The vessel is designed to carry a deadweight cargo of about 450 tons and to steam at a rate of about 8½ knots on service between the various coasting ports. During construction, the steamer, which was named the *Ekuro*, has been superintended by Mr. Steele and Mr. Wilkie, marine engineering superintendents respectively, Mr. Campbell being their local inspector.

Troja.—On Tuesday, October 20th, Messrs. Richardson, Duck & Co. launched from their yard a steel screw steamer of the following dimensions, viz.:—Length, over all, 309 ft.; breadth, extreme, 42 ft.; depth, moulded, 27 ft. 6 in.; gross tonnage, about 2,730 tons. This vessel, which has been built to the order of Messrs. A. C. de Freitas & Co., of Hamburg, will class 100 A1 at Lloyd's and has been built under special survey; she is of the spar deck type, with a large deckhouse forward of engine casing, in which accommodation is provided for eighteen first-class passengers. A cellular double bottom for water ballast is fitted throughout, also, after-peak tank, and the equipment includes large multitubular donkey boiler, four steam winches, steam windlass, stockless anchors, steam steering gear, &c. The engines, by Messrs. Blair & Co., have cylinders 22½ in., 37 in. and 61 in., by 42 in. stroke, steam being supplied by two single-ended boilers, working at a pressure of 160 lbs. As the vessel was leaving the ways she was christened *Troja* by Mrs. Sadler, of The Southlands, Eaglescliffe.

Begona.—On Wednesday, October 21st, Sir Raylton Dixon & Co. launched from their Cleveland Dockyard, Middlesbrough, a fine steel screw steamer built to the order of Senor Ramon de la Sota, of Bilbao, under the personal supervision of Captain Luis de Ytorra. She is built to Lloyd's highest class, partial awning deck rule, her principal dimensions being:—Length, 315 ft.; breadth, 42 ft. 6 in.; depth moulded, 22 ft. 5½ in., and has a deadweight carrying capacity of about 4,250 tons on a light draught of water. The accommodation for passengers and captain is in the poop, and for officers and engineers in after end of partial awning deck, with crew and firemen at fore end. Triple-expansion engines will be fitted by Messrs. Blair & Co., Ld., Stockton-on-Tees, having cylinders 22½ in., 36½ in., and 60 in. by 39 in. stroke, with two large single-ended boilers working at 160 lbs. pressure. On leaving the ways she was gracefully named *Begona* by Mrs. Dickinson, of Riding Mill, Newcastle.

Trunkby.—On October 21st Messrs. Ropner & Son launched at Stockton-on-Tees the first of the Trunk steamers, built under the patent of Mr. R. Ropner, junr. She is 300 ft. long, 45 ft. beam, and 22 ft. 2 in. moulded depth, and has a deadweight carrying capacity of about 4,100 tons on 19 ft. 3 in. draught of water. The steamer is single-decked with full poop, bridge, and topgallant forecastle, and a patent trunk about 7 ft. high, extending from poop to bridge and bridge to forecastle continuously. The steamer will be engined by Messrs. Blair & Co., Limited, and received the name of *Trunkby* from Mrs. Ropner, of Preston Hall.

Munster.—On October 21st Messrs. Laird Brothers, of Birkenhead, floated from their building dock the third vessel of the fleet in course of construction by the firm for the City of Dublin Steam Packet Co., which are intended to accelerate by half-an-hour the mail service between England and Ireland, in accordance with a contract recently entered into by the Government and the City of Dublin Co. Unlike the *Ulster* and *Leinster*, her two sister ships, the new vessel was not launched but floated, and therefore from a spectator's point of view the ceremony did not prove so interesting. The dock gates were gradually eased about nine o'clock, and by the hour fixed for naming the vessel she was fully afloat and ready to be taken in charge by the tugs *Wrestler*, *Columbus*, and *Sea King*, which were lying off the dock entrance. At ten o'clock a party of friends of the builders, including Mr. Elliott Lees, M.P., and Mrs. Lees, Mr. William Watson (chairman of the City of Dublin Co.), Mr. Edward Watson, Captain King, Mr. Benedict Jones, and a number of other ladies and gentlemen, proceeded on board the vessel, and mounted the forecastle, which was gaily decorated for the occasion. At the extreme fore was suspended from the jackstaff the usual bottle of champagne. All being ready, Mrs. William Laird gracefully severed the cord holding the bottle, and released the *Munster* (as she named the vessel) from her cradle. The booming of cannon and firing of rockets announced that the ship was afloat. She was speedily towed from the dock by the three tugs, and by a quarter to eleven o'clock the *Munster* was well inside the Alfred Dock entrance on her way to the West Float, where she will receive her boilers. It may be stated that the first of the mail steamers, the *Ulster*, was under steam October 21st, and the *Leinster* has her boilers in, and is now receiving her engines. The new vessels have already been fully described in our columns. Their dimensions are:—Length, overall, 372 ft.; breadth, moulded, 41 ft. 6 in.; depth, at side to upper deck, 29 ft. 3 in.; height from main to upper deck, 8 ft. 8 in.; tonnage, builders' measurement, 3,069 tons; draught of water ready for service, 14 ft. 6 in.; speed, 23 knots. The material of the hull is steel, and the vessels are fitted with machinery of modern type. The passenger accommodation will be perfect in every respect, and nothing will be wanting in equipment to make the vessels the most elegant and comfortable for the channel service. When the *Munster* was moored in the Alfred Dock lunch was served in the ladies' saloon, after which several toasts were honoured.

Chiriqui.—On October 22nd a smart screw steamer was launched by Messrs. Wigham Richardson & Co., Neptune Works, Newcastle-on-Tyne, for the West Coast service of the Pacific Steam Navigation Co., of Liverpool. The vessel is built of steel, 185 ft. in length by 31 ft. beam, and will be rigged as a two-masted schooner. She is to have well-finished accommodation for 22 first-class passengers, in 11 staterooms, all in deckhouses on the promenade deck, special attention being paid to the arrangements for securing the comfort of the passengers. On the main deck arrangements are made for carrying a large number of cattle. The steamer will be propelled by a set of compound engines, which, with the boilers, are also being constructed by Messrs. Wigham Richardson & Co. As the vessel left the ways she was named the *Chiriqui*, the christening ceremony being gracefully performed by Miss Thol, of Howlettes, Dulwich, niece of Mr. Wigham Richardson.

Rijnstroom.—On October 22nd there was launched from the Southwick Yard of Messrs. Robert Thompson & Sons a very finely modelled steamer, to the order of The Holland Steamship Co., of Amsterdam, specially designed for the fruit trade; her dimensions are:—Length, 237 ft. over all; breadth, 31 ft. 3 in.; depth moulded, 15 ft.; built to the highest class of Bureau Veritas, with cellular bottom and peaks for water ballast; quarterdeck aft, long bridge amidships, with accommodation for captain and officers, chart-room, &c., fitted up in solid oak; also large and spacious rooms for engineers, the crew being berthed in topgallant forecastle, three hatchways with steam winch to each, with derrick gear for rapid loading and discharging, steam steering and steam windlass. Cargo doors in sides, steam heating to all berths, and is fitted throughout with electric lighting by Messrs. Hayward, Tyler & Co., of London. The engines are by Messrs. Geo. Clark, Limited, with very large boilers to drive the vessel 13 knots per hour loaded. During construction the ship and machinery has been superintended by M. Fenenga, Esq., of Amsterdam. As the vessel left the ways she was gracefully christened the *Rijnstroom* by Miss *Lowes, of Sunderland.*

LAUNCHES—SCOTCH.

Ficaria.—On September 7th the *Ficaria*, a steel steam schooner of about 1,500 tons, was launched at Renfrew; owned by Forende Dampskibs Selskab. Del., Copenhagen.

Holyhead.—On September 21st the *Holyhead*, an iron steam tug, of about 60 tons, was launched at Rutherglen; owned by Mr. R. Garden, of Stromness.

Ebro.—On September 22nd Messrs. R. Napier & Sons, Limited, launched at Govan the third of the three steel screw steamers they have contracted to build for the Royal Mail Steam Packet Co., London. These fine steamships have been specially designed to meet the requirements of the company's extra service to Brazil and the River Plate, and are intended to carry a large cargo, with superior accommodation for first-class passengers and emigrants. The general dimensions are:—Length, 360 ft.; breadth, 44 ft.; depth, 27 ft.; with a topgallant forecastle, long bridge, and full poop, and a gross tonnage of 3,300 tons. The vessel is fitted in accordance with the Board of Trade regulations for passenger steamers. The upper deck and fittings are of teak, and the most modern appliances have been supplied for the working of the ship and the rapid handling of cargo. Superior accommodation has been provided amidships for first-class passengers, and as the ship is intended to trade in tropical climates, the roomy staterooms have been placed on the upper deck, and are furnished with all the latest improvements. Above, on the bridge deck, is a handsome dining-saloon, finished in polished hardwood and fitted with large sidelights, while overhead the boat-deck forms an admirable shelter, and the bridge-deck affords a spacious promenade for first-class passengers. Very comfortable accommodation has been provided for 700 emigrants on the main deck, with patent portable iron lattice berths and folding mess-tables and seats. The hospitals, dispensary, &c., are in the poop. The hull has a cellular double bottom all fore and aft, and is constructed in accordance with the recommendations of the bulkheads committee. There is a complete installation of electric light, and refrigerating machinery on the carbonic-anhydride system, with chambers of 7,700 cubic feet capacity for the transport of frozen meat, &c. The ventilating arrangements throughout the ship are exceptionally complete. The machinery consists of a set of triple-expansion engines, with cylinders 36 in., 42 in., and 70 in. diameter, by 4 ft. 6 in. stroke. There are three single-ended steel boilers, adapted for a working pressure of 180 lbs., and fitted with the most modern appliances for efficiency and economy, including Howden's system of forced draught. The vessel was named the *Ebro* by Mrs. J. G. A. Baird, wife of the member for the Central Division of Glasgow, and, after a most successful launch, was towed up the harbour to receive her machinery, which has been constructed at the builders' Lancefield Works. Afterwards the builders entertained the launch party at luncheon in the model room. The Royal Mail Steam Packet Co. was represented by Mr. Herbert Edimann, Mr. Arthur, Captain W. H. Owen, R.N.R., Mr. Westland, and Mr. Adamson. Amongst the others present were J. G. A. Baird, M.P., and Mrs. Baird; Mr. Jno. Hamilton, and Mr. Agnew. Mr. Hamilton, who presided, gave "Success to the *Ebro*."

Jules-Leonie.—On September 24th Messrs. Hawthorns & Co., Limited, launched at Leith a steam screw trawler to the order of J. Baels-Mauriex, Ostend. She will be fitted by the builders with engines of 350 H.P., working at a boiler pressure of 160 lbs. per square inch, and was named *Jules-Leonie*. This vessel is a duplicate of the *Jules-Michael*, recently built for the same owners.

Lindley.—On September 24th Messrs. Rodger & Co. launched at Port-Glasgow a barque about 246 ft. by 37 ft. 6 in. by 22 ft. 6 in. register, classed 100 A1 at Lloyd's, and carrying about 2,800 tons deadweight, for the Lindley Shipping Co., of Glasgow. On leaving the ways she was named *Lindley* by Mrs. Shaw, Botham Hall, Huddersfield.

Princess.—On September 24th the Grangemouth Dockyard Co. launched from their building yard a finely-modelled screw steamer to the order of the Charlestown Steam Navigation Co., Prince Edward Island, for passenger and mail service in Canadian waters. Her dimensions are:—165 ft. by 26 ft. by 18 ft. 3 in., and she has been constructed to Lloyd's highest class, with all recent improvements, and has been built under the superintendence of Mr. Robert Anderson, Renfrew, was designed to the specification of Messrs. Nicol M'Nicol & Co., Dixon Street, Glasgow. Her machinery, which consists of triple-expansion engines for a speed of 12 knots, will be supplied by Messrs. Muir & Houston, steam steering gear by Alley & M'Lellan, steam windlass by Clarke, Chapman & Co. As the vessel left the ways she was gracefully named *Princess* by Miss Rita Miller, daughter of the builder.

Itaya.—On September 25th Messrs. Scott & Co. launched at Greenock the twin-screw steamer *Itaya*, of the following dimensions:—Length, 181 ft.; breadth, 35 ft.; and depth, 10 ft.; and of 660 tons gross register. The *Itaya*, which will be supplied by the builders with triple-expansion engines, has been built for the Compannia Nacional de Navegacao Costeira, Rio de Janeiro.

Francis Henderson.—On September 25th Messrs. Murdoch and Murray launched from their shipyard at Port-Glasgow, the first of two steam pilot steamers they are building for the Mersey Docks and Harbour Board. Up till now the Mersey pilotage has been carried on entirely by sailing vessels, but the advent of these two steamers will mark a new departure, which although somewhat of an experiment it is hoped will prove a marked success. At all events the risk to life and limb will be reduced to a minimum, and the chances of a boatload of pilots getting adrift, as happened in the gales of last winter, are extremely remote. The dimensions of the vessels are.—Length, 128 ft.; breadth, 24 ft.; depth, moulded, 13 ft. The accommodation for 40 pilots is in four large state-rooms, two forward and two aft, and in the after end is the dining-saloon, pantry, and engineers' rooms, these latter having access to the engine-room without going on deck. Ample lavatory and bath accommodation is also provided, whilst the two master pilots have separate rooms in the forward cabin. The deck hands and firemen are berthed right forward. The entrances to both cabins are well protected from the weather, and are fitted up as smoking lounges. A shelter deck runs the entire length of the engine and boiler casing, and the boats are carried overhead. A steam windlass is fitted forward and a steam winch aft, which is fitted to lift the boarding boats into and out of the water without the davits being used. Davis's patent steering gear is fitted in a wheel-house on the bridge deck. As the vessel left the ways she was named *Francis Henderson*. Triple-expansion engines will be supplied by Messrs. David Rowan & Son. During construction both hull and machinery have been under the direct superintendence of Mr. Henry F. Payne, of Liverpool.

Chin Kiang.—On September 26th a steel schooner-rigged steamer, of about 125 tons, was launched at Aberdeen for Captain T. Thom.

Oolobaria.—On September 28th Messrs. William Denny & Brothers launched at Dumbarton a steel screw steamship of the following dimensions and tonnage:—410 ft. by 50·7 ft. by 28·9 ft., 5,300 tons gross register. She has been built to the order of the British-India Steam Navigation Co. The vessel was named the *Oolobaria*, and is a repeat of the *Onipenta*, *Okara*, and the *Okhla*, built by Messrs. Denny for the same owners.

Willscott.—On October 5th Messrs. Wm. Hamilton & Co. launched from their Glen Yard, Port-Glasgow, a steel sailing barque of 1,980 tons gross and 1,860 tons net register tonnage, to carry 3,400 tons deadweight, for Messrs. Hickie, Borman & Co., of London. The following are the principal dimensions:—Length, about 270 ft.; breadth, 40 ft.; depth, moulded, 25 ft. 1¼ in. The vessel has been built to the highest class at Lloyd's, and is fitted out in the most modern manner for the quick and easy working of the ship. The accommodation for the officers and crew are of the most complete description, the captain and officers being placed in the poop, while the crew are berthed in large deckhouse amidships, and the store and lamp-rooms are placed under the topgallant forecastle. A deckhouse containing stairway to saloon and chart room is fitted on the poop deck. As the vessel left the ways she was gracefully named the *Willscott* by Mrs. Hickie, of London. After the launch the vessel was taken to James Watt Dock, Greenock, for masting.

Lord Warden.—On October 6th the *Lord Warden*, a steel schooner-rigged steamer, of 1,000 tons gross, was launched at Dumbarton, owned by the London, Chatham and Dover Railway Co., London.

Hopper Dredger.—On October 6th Messrs. Fleming & Ferguson, Limited, shipbuilders and engineers, Paisley, launched from their yard a powerful suction pump hopper dredger. The vessel is constructed of Siemens-Martin steel, and has a hopper carrying capacity of 800 tons. She will be fitted with centrifugal sand pumps capable of raising 1,000 tons per hour from a depth of 35 ft., arranged for discharging either into her own hopper or on to shore through pipes. The main engines will be triple-expansion of sufficient power to drive the vessel at a speed of 9 knots per hour. Special gear will be fitted for raising and lowering the suction pipes, and the arrangements for lifting hopper doors are of the most modern description. She is built to the order of the Queensland Government.

Inyati.—On October 6th this steamer, built by Messrs. Hall, Russell & Co., of Aberdeen, to the order of Messrs. John T. Rennie, Son & Co., of London and Aberdeen, was successfully launched. She is the ninth steamer ordered by Messrs. Rennie from the same builders, and will be the largest and most powerful addition to their direct Natal line, being 310 ft. long, 40 ft. beam, and 24 ft. 7 in. deep. The vessel is of exceptionally good model, and has fine lines for high speed at sea. The ship is being fitted out in first-class style for passengers, with all the improvements and conveniences with which Messrs. Rennie's long experience of this service has made them conversant, and every detail of comfort at sea, absence of noise, and of heating and ventilation in hot climates, has received careful attention. The ceremony of christening the ship was gracefully performed by Mrs. John T. Rennie, the mother of the owners, and the launch was attended by Mr. George Rennie, the senior of the firm, and by one of the consulting engineers, Messrs. Flannery, Baggallay & Johnson, of London and Liverpool, from whose specification the machinery is being constructed. The ship immediately proceeded to take her heavy machinery on board, which will consist of triple-expansion engines with boilers of very large power. After completion the vessel will proceed to London to take up her regular service between that port and South Africa.

Lyster.—On October 8th Messrs. Wm. Simons & Co., Limited, Renfrew, launched from their yard at Renfrew a very powerful bucket ladder dredger, fitted with a chain of steel buckets, each having a capacity to raise a ton weight of dredgings from a depth of 46 ft.; two sets of tri-compound engines and two boilers constructed to Board of Trade, Lloyd's, and Manchester Steam Users' Association requirements for 180 lbs. pressure. Either set of engines is arranged to drive the bucket gearing, as well as for propelling the vessel by twin-screws. Electric light is fitted throughout. On leaving the ways it was gracefully named *Lyster*, in honour of the engineer to the Mersey Docks Board, by Miss Wood, Ardgowan, Kilmalcolm. The *Lyster* was launched with all machinery fitted on board complete, including the buckets, and ready for work.

Guyana.—On October 9th Messrs. Barclay, Curle & Co., Ltd., launched from their shipbuilding yard, Whiteinch, a handsome steel screw steamer, built to the order of Messrs. Caw, Prentice, Clapperton & Co., Glasgow, and intended for general cargo trade. The vessel is built to class 100 A1 at Lloyd's and to Board of Trade regulations, and will measure about 3,700 tons gross. On leaving the ways the vessel was named the *Guyana* by Miss Service, Nordhoff, Kelvinside.

Lynx, Aberdeen, Bradford.—On October 12th Messrs. Mackie & Thomson launched three trawlers, the *Lynx*, the *Aberdeen*, and the *Bradford*. The *Lynx*, a vessel of 160 tons, is for the Grimsby and North Sea Steam Fishing Co., and is an exact duplicate of the *Chameleon*, the *Crater*, *Cygnus*, and other boats lately launched from the same yard. The *Aberdeen* and the *Bradford* are the first instalment of an order for 25 vessels of the same type which Messrs. Mackie & Thomson are building for Messrs. Haggerup, Doughty & Co., of Grimsby. Their dimensions are:—Length, 90 ft.; breadth, 20 ft.; and moulded depth, 11½ ft. They are being fitted with triple-expansion engines by Messrs. Muir & Houston. The *Lynx* was christened by Miss Hanna, Edinburgh, and the other vessels by the Misses Mackie.

Paris.—On October 12th Messrs. A. & J. Inglis launched at Pointhouse a paddle steamer, 300 ft. long, for the Messagerias Fluviales del Plata of Monte Video. Her machinery is of the triple-expansion type of 3,500 H.P. This vessel is one of a long series of steamers built by the same builders for this company, and is luxuriously fitted up for passengers, the accom[illegible] being on all three decks. The vessel was named the [illegible] Miss B. Brown, of Giffnock.

Itamby.—On October 12th Messrs. Scott & Co., Greenock, launched a twin-screw steamer named the *Itamby*, for the Campannia Nacional de Navegacao Costeira, Rio de Janeiro, and will supply her with triple-expansion engines. Dimensions:—Length, 181 ft.; breadth, 35 ft.: depth, 10 ft.; and of 660 tons gross register. This is the last of three sister ships built by Messsr. Scott & Co. for this company.

Leonard Spear.—On October 21st Messrs. Murdoch & Murray launched from their yard at Port-Glasgow a steam pilot steamer for the Mersey Docks and Harbour Board, Liverpool. The dimensions of the vessel are:—Length, 128 ft.; breadth, 24 ft.; depth, moulded, 13 ft. On leaving the ways she was named *Leonard Spear*, and is an exact duplicate of the s.s. *Francis Henderson*, launched a few weeks since by the same builders. After the launch she was towed to Glasgow, where her machinery will be fitted by Messrs. David Rowan & Son.

Kanagawa Maru.—That Japan intends soon to occupy a foremost position amongst the world's maritime nations is evidenced by the large accessions she has made to her mercantile fleet in recent years, and if further proof were needed we have only to remind our readers of the large order which their premier steamship company, the Nippon Yusen Kaisha (through their local representative, A. R. Brown, Esq., Japanese Consul at Glasgow), recently placed with shipbuilders in this country, viz., ten large twin-screw steamers, representing an aggregate gross tonnage of 60,000 tons; of this order eight vessels are being built on the Clyde and two in Belfast. That they also intend in the near future to build their own fleets is shown by the appointment of an old Clydesider to the post of general manager of the shipbuilding establishment in Nagasaki, and his recent orders to our local makers of shipbuilding plant prove that they mean to be up-to-date with all improvements in machinery, whilst at the same time they rather astonished the shipbuilding community by announcing their intention of building a steamer of similar dimensions to those under construction here. Some comparatively small vessels have been built in Japan, but when this one will be completed she will have established a record for that enterprising country, and probably have given them the necessary experience and knowledge to become competitors for vessels which have hitherto been built in Britain. On October 22nd Messrs. David & Wm. Henderson & Co. successfully launched from their yard at Partick, the first of the ten steamers building in this country for the Nippon Yusen Kaisha. Her principal dimensions are:—Length, over all, 463 ft.; beam, moulded, 49 ft. 2 in.; depth, moulded, 33 ft. 6 in., and a gross tonnage of about 6,000 tons. Classed in Lloyd's 100 A1 three-deck rule. She has a straight stem and elliptic stern, a poop, bridge and forecastle, and will be rigged as a four-masted fore-and-aft schooner. Being intended for passengers as well as cargo, she has got fairly fine ends which will ensure her being a comfortable sea boat, and at the same time, carry a large deadweight and attain an average sea speed of fully 12 knots on a moderate consumption. Internally the vessel is divided into numerous compartments, there being no less than nine watertight bulkheads, whilst there is a complete double bottom fore and aft, also well subdivided, and in addition there is a deep hold tank abaft engine space extending to height of orlop deck which can be utilized for cargo or water ballast. The main and upper decks are of steel, the upper deck being sheathed with teak. The first-class accommodation is amidships, the dining-saloon under the fore end of bridge deck, is in polished oak with neat hardwood mouldings, mahogany tables, handsome hardwood revolving chairs and punkah over each table. Smoking-room is on bridge deck and has a polished hardwood dado with lincrusta panels above, couches are fitted round the sides, whilst mahogany card-tables and revolving chairs are fitted in centre. The first-class staterooms are mostly on top of bridge deck, but a few are on upper deck in vicinity of the saloon; each room is of large size and is complete with berths, spring mattresses, sofa, and patent lavatory. Officers, engineers, doctor, purser and chief steward are berthed in rooms amidships; they are all of special large size. Separate mess-rooms and pantries are provided for officers and engineers. Above bridge deck there is a large teak deck-house forming captain's room, chart-room and wheelhouse, and the captain's room is a roomy compartment. The chart-room and wheelhouse are fitted up as customary, with table, flag lockers, etc. Between poop and bridge there is a large steel deck-house forming saloon, staterooms and pantry for second-class passengers. The staterooms are finished in similar style to those of the officers and engineers. A galley for European passengers is fitted at after end of engine casing on upper deck and is complete with a large cooking range, baker's oven, rice boiler, etc. Saloon pantry, in addition to the usual fittings, has a steam carving table. Poop aft is fitted up with rooms for freight clerks, apprentices, Japanese galley, serving room and scullery, etc., for second-class and steerage passengers. The after 'tween deck is fitted with portable berths for about 150 steerage passengers. Treasure-room, parcel-room and silk-room are also fitted in 'tween decks. The topgallant forecastle is fitted up for seamen, quartermasters, cooks, waiters, crews' galley, wash-houses, etc., and immediately underneath is the quarters for firemen and separate rooms for greasers and donkeymen. An icehouse and cooling room is fitted in forward 'tween decks. Strict attention has been paid to have the rooms well ventilated, all lights being of specially large size; nearly all the midship rooms have lights in each, those on top of bridge deck being Broadfoot's patent 14 in. diameter swivel lights. A most complete installation of electric light by W. C. Martin & Co., is being fitted throughout the vessel, and includes two engines and two dynamos, Suez Canal search light, five 100-candle power deck lights and ten 200-candle power cargo lights. The cargo hatches are six in number and for the rapid loading and discharging of cargo there are 12 steam winches and the necessary derricks and cargo gear. There are 12 boats, two of which are of steel. The steam steering gear is of Caldwell & Co.'s make and is placed aft in poop with angled barrels giving a direct lead on to quadrant. Hastie's rudder brake is fitted on the rudder and patent spiral springs are on quadrant. A warping capstan by Clarke, Chapman & Co., is fitted on top of poop deck. The capstan windlass on forecastle head is Napier Bros. latest patent. Dining-saloon, cargo holds, 'tween decks and engine and boiler spaces are all thoroughly ventilated on the Baird, Thompson principle; the upcast ventilators to cargo spaces have patent heads and the downcast ones are of improved construction to prevent water getting below. Chadburn's telegraphs are fitted from bridges to engine-room, to poop and to forecastle head. The machinery will be supplied by the builders' firm, and consists of two sets of triple-expansion engines, each having cylinders 20 in., 33½ in. and 56 in. diameter by 48 in. stroke, steam is supplied by two large double-ended and two single-ended boilers, constructed for a working pressure of 200 lbs. per square inch. Amongst the auxiliary gear there is Weir's feed heater pumps and evaporator, Murdoch's governor, propellers of manganese bronze, steam ash-hoist and all the latest improvements, including Wotherspoon & Davies' feed filter. During construction the vessel has been built under the supervision of A. R. Brown, Esq., Glasgow, who has been assisted by Captain Periam and Mr. George MacFarlane. On leaving the ways the vessel was gracefully named the *Kanagawa Maru* by Mrs. A. R. Brown.

Devona.—On October 22nd Messrs. Charles Connell & Co. launched from their Scotstoun shipbuilding yard, Whiteinch, a steel screw-steamer, built to the order of Messrs. William Thomson & Sons, Dundee, for their Canadian and general trade. As the vessel left the ways she was named *Devona* by Miss Watson, Dowanhill. She is a duplicate of the *Cervona*, launched for the same owners last month.

Hesperus.—On October 22nd Messrs. Gourlay Brothers & Co. launched from Camperdown shipyard, Dundee, a vessel of 570 tons, built to the order of the Commissioners of Northern Lights. Her dimensions are:—Length, 125 ft.; breadth, 28 ft.; depth, 14 ft. 6 in. The vessel, which was christened the *Hesperus* by Mrs. Cheyne, wife of Sheriff Cheyne, Renfrew, is intended for special service in carrying stores and reliefs to the lighthouses, replacing bouys, &c.

LAUNCHES.—IRISH.

Magician.—On September 11th the *Magician*, a steel steam vessel of about 4,910 tons, was launched at Belfast, owned by Messrs. T. & J. Harrison, Liverpool.

Gaika.—On September 22nd Messrs. Harland & Wolff, Belfast, launched the new steel twin-screw steamer *Gaika*, for the Union Steamship Co.'s service to and from South Africa. This is the second of three new vessels, similar in design to, but larger than the four "G's" already running in the Union Line. The new vessels are over 6,000 tons gross, and will be propelled by twin screws, driven by two sets of triple-expansion engines. The *Gaika*, which will have unusually extensive accommodation for passengers, will be fitted up with electric light and every modern convenience.

City of Sparta.—On October 9th an addition was made to the City Line of steamers by the launch of a large screw steamer from Messrs. Workman, Clark & Co., Limited, Belfast. This vessel is intended for the passenger and cargo service of Messrs. George Smith & Sons, between Glasgow, Liverpool, Bombay and Calcutta, and has been specially designed to suit the special requirements of their trade. The christening ceremony was gracefully performed by Mrs. Smith, of Glasgow, who named the vessel *City of Sparta*. The vessel has been built to the regulations of the British Corporation of Shipping, and will receive their B.S. class and also Board of Trade Passenger certificate. The principal dimensions are: Length, 430 ft., between perpendiculars; breadth, 50 ft. 3 in.; depth, 32 ft. 5 in., and will be capable of carrying a large deadweight cargo. There are two steel decks, the upper being also sheathed with teak, and a poop, long bridge and topgallant forecastle decks, all of teak, a cellular double bottom extends fore and aft for water ballast. The hold beams have been dispensed with and deep framing introduced, leaving the holds unobstructed for cargo purposes. The holds are five in number and at the two main hatches are provided with four powerful steam winches and derricks each, six of these derricks being suspended from crane posts which also act as ventilators. For working the bridge hatch a special winch has been provided with extended ends on each side, and with those at the other hatches making a total of 13. The poop has been fitted up for the crew, and under the after-part of the bridge are the rooms for petty officers, mess-rooms, stewards, &c. Alongside the engine casing on the bridge deck is the deck-house with the accommodation for the officers and engineers, dispensary, &c. The passengers are housed in a large steel deck-house at the forward end of the bridge with the saloon placed in the centre and tastefully fitted up in polished hardwood of various shades. A sofa extends across the front and at the opposite end are two sideboards and fireplace in the centre. Each state-room is comfortably furnished in pitch-pine and ash with wire mattresses and patent lavatory, and well lighted and ventilated by a large window. The remaining portion of the house is taken up with rooms for the doctor, stewards, ladies and gentlemen's bath, &c. A teak house above the saloon-house is arranged for the captain with a separate chart-room and pilot-house in front. The various engines for navigating the vessel are of the most modern and approved construction, and the various outfits, as in vessels of this line, are most complete. A complete installation of electric lighting will be introduced throughout, including cargo lamps, mast and sidelights. The machinery has been constructed at the builders' engine works, and consists of triple-expansion engines of high power, the cylinders being 28 in., 47½ in. and 78 in. diam., with a stroke of 60 in. Steam is supplied from two steel boilers at a pressure of 190 lbs., and a separate boiler for the auxiliary machinery is placed on the upper deck. The construction of both engines and boilers are also to the requirements of the British Corporation. The ship and engines have been under the supervision of Captain Anderson and Mr. Lang, the owners' superintendents.

LAUNCH—BELGIUM.

Princess Clementine.—On October 22nd, from Messrs. Cockerill's shipbuilding yards at Hobroken was launched the new paddle-steamer *Princess Clementine*. Although the last two or three vessels built for this line have been all of a very elaborate description, an attempt has been made in the present case to eclipse everything previously accomplished in the cross-channel steamers built for this service. No expense is to be spared upon the decoration and upholstering of the vessel, which are to be on the most luxurious scale. The length of the vessel is 340 ft. between perpendiculars; breadth, outside paddle-box, 77 ft., with 38 ft. inside, and is to have four decks. She will have compound engines, which are to be of no less than 8,500 H.P., from which it is estimated she will be able to attain a speed of 26 miles per hour, which will be the highest yet attained by the cross-channel boats. The launching ceremony was performed by Prince Albert, of Belgium, and is to be ready for the mail and passenger service between Dover and Ostend by next March.

TRIAL TRIPS.

Gunther.—On September 12th the trial trip of the s.s. *Gunther*, built by the Elsinore Iron Shipbuilding and Engineering Co., Elsinore, Denmark, to the order of the Steam Navigation Co. of 1889, of Hamburg, took place in the Sound. Her dimensions are 240 ft. by 34 ft. by 15 ft. 10 in. depth of hold. During the trial trip the normal speed was 10¼ knots.

Karthago.—On September 18th the trial trip of the steamer *Karthago*, which is the most recent addition to the fleet of steamers belonging to Messrs. A. L. de Freitas & Co., of Hamburg, was successfully carried out. The new vessel has been built by Messrs. J. Priestman & Co., Southwick, for passengers and general trades between Hamburg, Brazils and the River Plate. She is 312 ft. long, 42 ft. broad, and 27 ft. 6 in. moulded depth to spar deck, being constructed to the highest class in Lloyd's registry for spar-deck vessels. The cargo holds are subdivided by six steel bulkheads, and are also fitted with water ballast tanks fore and aft, constructed on the cellular double bottom principle. The engines and boilers have been supplied by Messrs. Blair & Co., of Stockton, and, together with the ship, gave every satisfaction during the trial. When the vessel was run over the measured mile she attained an average speed of 12·16 knots, which was considered highly satisfactory. Mr. Max Rother, engineer, of Hamburg, superintended the vessel and engines during construction, and represented the owners at the trial.

Yucatan.—On September 22nd the new steel screw steamer *Yucatan*, just completed by Messrs. Archd. M'Millan & Son, Limited, Dumbarton, for Senor Don Domingo Abaunza, of Tobasco, went down the Firth of Clyde on her trial trip. The vessel—the dimensions of which are 215 ft. by 30 ft. by 20 ft. 6 in.—has been built for passenger and general carrying trade in the Gulf of Mexico. The machinery, which is of the triple-expansion type, has been constructed by Messrs. R. Napier & Sons, Limited, Glasgow. The speed attained over the measured mile was 11½ knots.

Lourenco.—On September 25th the steel screw tug *Lourenco*, built by Messrs. Carmichael, Maclean & Co., Greenock, for the Castle Line Co.'s service in South Africa, completed her steam trials with satisfactory results, the average rate of speed attained being 8½ knots per hour. The engines were supplied by Messrs. Kincaid & Co. The owners were represented by Mr. Scott and Mr. Munn, and the builders by Mr. Maclean. The *Lourenco*, which is 60 ft. in length over all, will be employed in connection with the Castle Line steamers.

Canada.—On September 26th the Royal Mail steamer *Canada*, launched in May last from the shipbuilding yard of Messrs. Harland & Wolff, Belfast, for the Dominion Line, went on her trial in Belfast Lough, and afterwards proceeded to Liverpool. The steamer has a tonnage of over 8,000, and is in many particulars fitted out similarly to the *Majestic* and *Teutonic*, built some years ago by the same firm for the White Star Line. She has all the latest improvements for cargo and passengers. Mr. Richards, one of the managing owners; Alderman Pirrie (Lord Mayor of Belfast), and Mr. Thomas, superintendent, were among those on board.

Tadorna.—On Saturday, September 26th, the steamer *Tadorna*, which has been built by Messrs. Wigham Richardson & Co. for the Cork Steam Ship Co., Limited, of Cork, went for a very successful trial trip off the Tyne. The vessel is built of steel, being 255 ft. in length, by 33½ ft. beam, rigged as a two-masted schooner; she has very comfortably fitted accommodation for a limited number of passengers, and has complete arrangements for working the cargo, including four steam cranes and two steam winches. The engines and boilers have also been constructed by Messrs. Wigham Richardson & Co., and on the trial trip worked without the slightest hitch, giving satisfaction to all concerned and driving the vessel at a speed of about 12½ knots. The trial trip was attended by Mr. F. C. Kelson, of Liverpool, the superintendent engineer of the company, and Captain Hore, their Commodore Captain, as well as by Captain Booth, who will take command of the vessel, and Mr. J. Denham Christie, of the builders' firm, was also present.

Rio Affua.—On September 28th the new twin-screw steamer *Rio Affua*, built by Messrs. Russell & Co., of Glasgow, and engined by Messrs. Kincaid & Co., underwent her trial trip in the Gareloch, and attained an average speed of 11½ knots [illegible] considerably above the guarantee.

Capitan Orella.—On September 30th Messrs. Laird Bros., of Birkenhead, took out the *Capitan Orella*, the first of the 30-knot destroyers they are building for the Government of Chili, to make her full power official trial on the Clyde. The mean speed obtained on six runs was 30·17 knots, with 361 revolutions, and the average revolutions for the three hours were 362·5, giving a somewhat higher average speed of 30·23 knots for the continuous running. There was a fresh breeze from the south and a lumpy sea, but the vessel proved a very steady sea boat, and much satisfaction with her performance was expressed by Captain Romulo Medina, who represented the Chilian Naval Commission (in the unavoidable absence of Admiral Luis Uribe), and the other Chilian officers who were on board.

Dunraven.—On September 30th the new steamer *Dunraven*, recently built by Messrs. Ropner & Son, of Stockton-on-Tees, for the Dunraven Steamship Co., Limited, Cardiff, left the River Tees to make her official trial trip. After the steamer's compasses had been duly adjusted in the Tees Bay the vessel proceeded on her voyage to New Orleans, having taken on board at the Corporation Wharf, prior to the trip, a large quantity of coals to enable her to make a long voyage. The owners were represented by Mr. Maxwell Hill and Captain Hesketh, under the joint supervision of whom the steamer has been built, and who, at the conclusion of the trial, expressed themselves highly pleased with the results of the trip.

Bengal.—On October 2nd the steamer *Bengal*, a new addition to the Red Cross fleet, built by Messrs. Cook, Welton & Gemmell, and engined by Messrs. Amos & Smith, underwent her steam trials in the Humber, steaming to and from Spurn, during which the machinery was thoroughly tested, and found to be satisfactory. The steamer is a new departure in steam fleeters, having been fitted with double bottom and water ballast from forward to engine-room. Her dimensions are—100 ft. by 21 ft. by 11 ft. 10 in. The vessel is fitted with engines of the triple-expansion type of 35 H.P.N., with cylindrical steam boiler, having a working pressure of 180 lbs. per square inch. The owners (Messrs. The Hull Steam Fishing and Ice Co., Limited), were represented by Mr. Maddick and Mr. Beath; the shipbuilders by Mr. Common; and the engineers by Mr. Brackenbury.

Oceano.—On Saturday, October 3rd, the steel screw steamer *Oceano*, built by Sir Raylton Dixon & Co., Cleveland Dockyards, Middlesbrough, to the order of Messrs. Gellatly, Hankey, Sewell & Co., London, for the Plate Steamship Co., proceeded to sea for her official trial trip. The vessel is of the spar deck type, with poop bridge and forecastle, classed 100 A1 at Lloyd's, and has a deadweight capacity of about 4,200 tons on a large draught of water. The accommodation for captain, officers and engineers is in houses on bridge-deck, and crew in topgallant forecastle. Engines of the triple-expansion type have been fitted by Messrs. The North Eastern Marine Engineering Co., Limited, Wallsend-on-Tyne, having cylinders 23 in., 36 in., 59 in., by 42 in. stroke, and supplied with steam by two large single-ended boilers working at 180 lbs. pressure and fitted with Howden's forced draught, duplicate fan engines and other improvements. The vessel and machinery have been constructed under the supervision of Captain John, the owners' superintendent. During the trials everything passed off most successfully, and gave great satisfaction to all concerned.

Wingrove.—On October 6th the new steamer *Wingrove*, recently launched at Sunderland by Messrs. Short Brothers, was sent on her trial trip, and the results obtained were satisfactory. The vessel, which has been built to the order of the Wingrove Steam Shipping Co., London, is of the improved spar-deck type, having single deck laid, with open beams on main deck. She is fitted with a cargo poop, long bridge amidships, on which is accommodation for captain and officers, saloon, mess-rooms, &c., and topgallant forecastle for crew. The engines, which have been supplied by Messrs. John Dickinson & Sons, Limited, have cylinders of 23 in., 38 in. and 62 in. by 42 in. stroke, and two large steel boilers. After adjusting compasses the vessel was taken a series of runs over the measured mile, and a mean speed of 13 knots obtained, the engines running smoothly and with an absence of vibration. During construction the vessel and engines have been under the supervision of Mr. W. Parker, of London.

Harborne.—On October 7th the new steamship *Harborne*, which has been built by Messrs. S. P. Austin & Son, of Sunderland, to the order of Messrs. J. & C. Harrison, of London, was taken to sea for trial. The compasses were adjusted early in the morning, and immediately on the embarking of a party of gentlemen on board the new steamer she made her way northward to Whitley, and the measured mile was gone over several times. During the trials there was an opportunity to inspect the vessel by those not engaged in taking note of her performance in speed, and a fine compact boat they found the *Harborne* to be. She is specially designed for the coal trade, her fittings at the same time being exceptionally complete for a collier. The vessel's tonnage is 1,278 gross and 785 net, her length being 235 ft., breadth 34 ft., and depth 14·35 ft. The engines have cylinders 18½ in., 30 in., and 49 in., with 33 in. stroke. There are three hatches, two forward and a large one aft, though all of them are extra large, the vessel being arranged in fact as a "self-trimmer." In the course of the trial runs a number of exhaustive tests were made, the vessel being fully loaded at the time. The speeds attained were highly satisfactory, the engines and other machinery working smoothly throughout, while Captain Himsley said he had found the *Harborne* to be a good sea-going vessel.

Capitan Munos Gamero.—On October 15th Messrs. Laird Bros. took out on the Clyde the *Capitan Munos Gamero* for her official three-hours' full speed trial. This vessel is the second of the four 30-knot destroyers they are building for the Chilian Government, the first of which, the *Capitan Orella*, was successfully tried on September 30th. The *Munos Gamero* made an equally successful trial as her sister vessel, in fact, the speed on the measured mile exceeded the latter's performance. The mean speed obtained on the six runs on the mile was 30 42 knots with 369 revolutions, and the speed for the three hours' continuous steaming was over 30 knots, the mean revolution for this time being 365. At the conclusion of the three hours' steaming, trials were made with the vessel going astern full speed the results being very satisfactory. The Chilian Naval Commission was represented by Captain Romulo Medina, in the unavoidable absence of Admiral Luis Uribe; and there was on board Captain Lopez, the future commander of the vessel; Mr. Forbes, and other Chilian officers.

Nubia.—On October 16th the *Nubia*, built by Messrs. Harland & Wolff, for the African Steamship Co. (Messrs. Elder, Dempster & Co.) in 1878, was taken for her steam trials in Liverpool Bay, after undergoing extensive alterations made by the firm of Messrs. David Rollo & Sons, Fulton Engine Works, Liverpool, which places the ship on a better footing, and enables her to compete with the more modern class of ship. Originally she was fitted with ordinary compound engines, supplied by steam from two low-pressure boilers, and had an I.H.P. of 1,056. The engines propelling the vessel are now of the triple expansion type, operating on three instead of two cranks as before. A Morison's patent evaporator is also fitted in the engine-room. Steam is obtained from two steel single-ended boilers at a pressure of 150 lbs. The boilers are fitted with Morison's suspension furnaces. The draught is natural. On the trial a speed of 12½ knots was obtained, the engines indicating 1,235 H.P. and making 63 revolutions. So far as passengers are concerned, a considerable sum of money has been spent in providing ampler and better accommodation than before. Instead of the after deckhouse—practically a storeroom—which stood on the after end of the main deck, a full poop has been erected, quite altering the appearance of that end of the ship, and adding to her already fine appearance. In the poop berth accommodation has been provided for an additional 27 passengers, the state-rooms being ranged round the side of the vessel, and are thoroughly ventilated, commodious, and well furnished. The dining saloon contains one long central table, with revolving chairs upholstered in red plush, the settees in the cabins being to match. At the fore end of the saloon the pantry is situated, which communicates over a central sideboard by means of an adjustable panel into the saloon. The officers' and pursers' rooms are also situated under the poop. The steering gear has been carried up to the top of the poop deck, being formerly on the main deck. Accommodation is now provided for 61 passengers. The electric light has been fitted throughout the ship by Messrs. Holmes, of Newcastle, and electric bell communication is established between each of the passengers' rooms, also other places used by them, and the steward's department: there is an ice-house, capable of carrying 35 tons of ice and provisions for the trip. Throughout the passengers have been considered. Several gentlemen accompanied the *Nubua* on her trial, embarking by tender (the *Challenger*) from the landing-stage. Amongst those present were:—Messrs. G. Rollo, M. Rollo, J. Mackenzie and F. C. Kelson (Cork Steamship Co.). Messrs. Elder, Dempster & Co. were represented by Messrs. Alexander Sinclair, H. J. Ward, J. H. Christian (underwriting department), and by Captain Rattray, marine superintendent, and Mr F. Stevenson, superintending engineer, these gentlemen having superintended the work on behalf of the owners, on deck and in the engine-room respectively. The Board of Trade was represented by Mr. Currie and Lloyd's by Mr. Milner. The result of the trip was considered very satisfactory, everything working smoothly and well. The *Nubia* is commanded by Captain Addison.

Francis Henderson.—On October 17th the new steam screw pilot steamer, *Francis Henderson*, built by Messrs. Murdoch & Murray, Port-Glasgow, for the Mersey Docks and Harbour Board, went on her official trial trip on the Clyde. There was a fresh breeze blowing, and the steamer was run for six hours at full speed on the measured knot. At Skelmorlie the speed on a mean was fully 10½ knots. The dimensions of the steamer are as follows:—Length, 137 ft.; breadth, 24 ft.; depth, moulded, 13 ft. The accommodation is for 40 pilots, this being arranged in two large state-rooms forward and two aft, and a large saloon is placed immediately abaft the engine-room. Two rooms are also fitted forward for the master pilots. The engineers are berthed aft, with access to the engine-room without going on deck. The crew and firemen are berthed right forward. An oil distributor is fitted up forward of the collision bulkhead. The machinery, which has been supplied by Messrs. D. Rowan & Son, of Glasgow, is on the triple-expansion system. The cylinders are 12 in., 18 in., and 30 in. in diameter, by 22 in. stroke, steam being supplied at 180 lbs. working pressure by a large steel boiler. The vessel has been built to the specification and under the personal supervision of Mr. Henry F. Payne, of Liverpool. The *Francis Henderson* will take her place on the station in a few days. At the trial the Mersey Docks and Harbour Board were represented by Captain E. C. Wheeler and Mr. Henry F. Payne.

Savan.—On October 19th the new screw steamer *Savan*, built and engined by Messrs. John Readhead & Sons, West Docks, South Shields, to the order of Messrs. Scrutton, Sons & Co., London, was taken to sea on her official trial trip. The vessel is of the spar-deck type, with poop, bridge and topgallant-forecastle, and iron deck houses, with accommodation for captain and passengers, and is of the following dimensions:—Length, 312 ft.; breadth, 41 ft.; depth moulded, 25 ft. 7 in., and classed 100 A1 at Lloyd's under special survey. The engines are of the triple-expansion type, having cylinders 25 in., 40 in. and 65 in., with 42-in. stroke, supplied with steam from one large steel boiler fitted with Howden's patent forced draft, and working at a pressure of 160 lbs. per square inch. The vessel is intended for the West Indian trade, and has been built under the superintendence of Mr. Barringer and Captain Norris, both of London. The runs over the measured mile were very satisfactory, a speed of 12 knots being attained. The machinery works very smoothly, the trial altogether being highly successful and quite up to the anticipations of both owners and builders.

Tehuantepec.—On October 21st the new steel screw steamer *Tehuantepec*, just completed by Archd. M'Millan & Son, Limited, Dumbarton, for Senor Don Domingo Abaunza, of Tabasco, went down the Firth of Clyde on her trial trip. The vessel—the dimensions of which are 215 ft. by 30 ft., by 20 ft. 6 in.—has been built for passenger and general carrying trade in the Gulf of Mexico, and is a repeat of the *Yucatan*, delivered by the builders last month. The machinery, which is of triple-expansion type, has been constructed by Messrs. R. Napier & Sons, Limited, Glasgow. The speed attained over the measured mile was 11½ knots, which is highly satisfactory, and in excess of what was expected.

Marine Engineers' Examination.—At the examination held by the Board of Trade on October 13th, 14th, and 15th, Mr. J. F. Peacock, of Bristol, and Mr. L. Johnson, of Liverpool, passed for extra first-class engineer, the former gentleman succeeding the first time of going up. They were prepared by Mr. Thorn, 5, Waterville Terrace, North Shields, and make the thirty-third and thirty-fourth success in this grade from the above establishment.

Reviews.

Lean's Royal Navy List for July, 1896. London: Wilperts & Co.

EVERY issue of this standard publication seems to be an improvement on its predecessor. The editors have desired to afford the public something more than a bald record of names and ships. Their desire has been to chronicle the individuality—as far as it might be worth chronicling—of those who compose our first line of defence. In the case of a force so vast as ours—for that it is large cannot be disputed, even if there be grave doubts as to its being large enough for the responsibilities of the Empire—and of a force which is constantly engaged in contests with savage foes, and the forces of nature, there must always be a large number of persons whose record is of general interest. Modesty and self-reserve are well-known characteristics of those whose achievements are most noble; and however laborious and painstaking editors may be, it may well be understood that full records of personal details could not be obtained in a moment. This last issue of *Lean's Navy List* is more complete, and consequently more interesting, than its predecessor, and the book is an invaluable work of reference to the general reader and journalist, as well as to the service man and the naval historian. The latter, indeed, will find that much of his work is cut and sheaved for him in these pages. To those who are interested in the recent and rare conferment of the Albert Medal of the First-class, the record of services which have earned it on the most recent and all previous occasions, may be recommended. But to all who are interested in the *personnel* of the Royal Navy and of the Royal Naval Reserve this book is indispensable.

The Spectator Mathematical Tables. (Actuarial). By J. W. Gordon. London: The *Insurance Spectator* of London. 1896.

THESE tables will be found of the greatest value to the actuary. They consist of a complete set of logarithms, cologarithms, antilogarithms and reciprocals. The table of reciprocals is so calculated that the subtractive proportional parts are got rid of and additive parts take their place. The advantages of this arrangements hardly need emphasising. The work is printed upon a folding card, which fits into a case suitable to go on to the book-shelf, whilst at the same time the whole can be opened out so as to make the tables easy of instant reference to the worker. This shows how the convenience of the busy man has been studied, but this is by no means the only mechanical facility enlisted in his service. The four functions for each datum-number are given together, but they are clearly distinguished from each other by the type in which they are printed, and there is no possibility of confusion. The whole of this laborious work of calculation seems to have been done with an eye to practical needs, and we shall be greatly surprised if practical men do not avail themselves of the time-saving labours which Mr. Gordon has devoted to their service.

Practical Mechanics applied to the Requirements of the Sailor. By Thos. Mackenzie. London: Charles Griffin & Co. 1896.

THIS volume is one of Messrs. Griffin's nautical series, and it is a very useful and practical work. It discusses mechanics and hydrostatics from the point of view of the sailor, and enlightens him on the problems with which his work renders him most familiar. The writer is not only a scientific man, but he is also a master mariner, and he is aware from his personal experience of the class of problem with which his professional brethren are most likely to be confronted. He begins, therefore, with a simple explanation of the mechanical laws and the usual discussion of the simple mechanical forces which are concerned in the lever and the wheel and axle. But he adds what we may almost call a topical interest to the discussion by choosing for his examples matters which especially concern the service of the sea, and by incorporating in them the language with which those for whom he writes are most familiar. Thus when he is concerned with the principle of the wheel and axle we see the work of the ship's windlass and the capstan, as well as various types of other applications of the same principle in use at sea explained. The theoretical power of tackles, the principles of the derrick and crane, the strength of spars and the large question of the centre of gravity with its application to the stowage of cargo, are all clearly gone into. In the chapter on the inclined plane the work needed to place a vessel on a slipway is shown. A chapter is given to the mechanical work of sails in propelling a ship, and another on paddles, whilst another treats of the action of the water on her rudder. Under the head of hydrostatics, the pressure on bulkheads and the work of pumps is gone into. Stability of vessels, the effect of heat on gases and other important questions are also discussed, and it will be seen that the matters treated of are such as may well claim the attention of deck officers. The work will well repay their study, for the treatment of topics chosen is well worthy of the judgment shown in the selection.

The Junior Salon. Percy Lund & Co., Bradford and London, 1896.

THIS is the Summer Double Number of the *Junior Photographer*, and is a publication which we have on previous occasions brought under the notice of our readers. We have only to say now that the present issue fully maintains the high standard of excellence reached by its predecessors. The gallery reproduced in its pages shows us studies undreamt of by the photographer of a few years ago. The sea pieces and woodland glimpses not only reflect nature at her loveliest, but also show the true artistic instinct in those who choose the subject and the moment for representation. Besides these we find portraits and representations of things which it would seem almost impossible, through want of light, for the camera to apprehend. To the reviewer himself perhaps the most interesting page was the last, for its subject was a tour in Norfolk, and his notice is being written on the placid waters of the Broads. We must not, however, confine our attention to the pictures alone, interesting as they are, for the letterpress deals with subjects of interest to the amateur. There is a touring competition, as is proper at this season when everyone is holiday-making. The column of answers to correspondents shows by itself how useful such a publication must be to those who are in difficulties with regard to the carrying out of their work in connection with this most fascinating and useful pursuit.

The Practical Engineer's Handbook. By W. S. Hutton. London: Crosby, Lockwood & Co. 1896.

THIS is the fifth edition of this most useful and complete book. Certain additions have been made throughout the volume to bring it fully up to the knowledge and requirements of the day. It is some four years since we last noticed the work and it is needless to point out the advances that have been achieved since that time. The arrangement of the work is as in previous editions. The first section deals with air and water engines and the increasingly important class of gas engines. But there are other matters upon which information is afforded besides the actual engine, whatever may be the motive power employed. There is useful information given as to the properties of air, water and gas, and the method of making oil gas by various patents is gone into. This section deals, too, with oil-fuel and the subject of combustion of fuel. The next deals with boilers and the rules of their construction as adopted by Lloyd's and the Board of Trade, as well as the subject of evaporation. We find here some discussion as to the performance of the locomotive boiler as adapted for use at sea, but the references to the now most important type of water-tube boiler are very small. This is the more strange as the modern quadruple-expansion engine, which hardly seems yet to have reached the stage of general acceptance, is given greater attention. The third section treats of condensation, the moving parts of the engine and the valve-gear usually employed, such, for example, as the Corliss, Joy's, and Bremme. Then come propellers, including others beside the screws and the shafts and connecting rods. At page 354 we see the table which we think was originally compiled by the late Mr. John, of the Barrow Shipbuilding Co., giving the dimensions and other particulars of the great steamers of his day with various coefficients. As the latest vessel in this table is the now eleven year old *Aller*, it might be well if in the next edition some more recent vessels were introduced into the table. In this connection we find tables of great value to the marine engineer. The sixth section deals with horse-power and the action in the cylinder, and this leads to the introduction of various types of steam-engine. The final section deals with the strength and other properties of materials such as the usual metals and timber. The tables, and indeed all the information afforded, has been selected with a view to the practical needs of the profession and the contents of the book generally have been brought well down to the requirements and knowledge of the present day. Though the number of books on engineering subjects is legion nowadays, and though the cry still is "they come," it is safe to say that the works of Mr. Hutton are still as valuable to the engineer as they were formerly, and no rival has yet come forward which is likely to in any way supplant them in the bookshelf of the practical man.

The Universal Directory of Railway Officials. 1896. By S. Richardson Blundstone. London: The Directory Publishing Co., Limited. 1896.

WE have to welcome the second appearance of this most useful annual. Needless to say that the issue marks an important improvement on its predecessor. The subject treated is so large, and the ground covered so universal, that it was absolutely impossible for a first edition not to leave some points untouched. Besides, there is a charming characteristic of those to whom application for information to be inserted in works of reference. It is as extraordinary as it is provoking. The men to whom such applications for material is made, are essentially the persons to whom the work, when completed, is most useful. Yet they abstain from assisting the compilation by filling in the forms sent to them, and either destroy them altogether, or put them on one side for months before returning them. When we regard this characteristic and the remoteness of some of the countries which are comprised in the railway world, we can only express surprise that the information is so recent and so complete as it is. That regarding the Prussian State Railways and those of Sweden, Russia, and the United States have been largely extended. The information aimed at gives the mileage, gauge, particulars of the rolling stock, and if any, of the steamship fleet of the line, and of the hotels it owns, as well as the names and addresses of the directors, and of the principal officers of the undertaking. Though the latter are arranged under the heads of their respective railways, access to particulars concerning individuals is facilitated by a good index of names. The design of the book is excellent, and it fills a very important void in the reference library. The author has evidently taken immense pains in the elaboration of his ideas, and we may be sure that the book will be found indispensable to all railway officials, and to contractors and others whose business makes them desire to get in touch with those who control our arteries of commerce.

Electrical Engineering as a Profession: How to enter it and Guide to the Engineering Profession. By A. H. Southan. London: 1896.

THE object of the present work is, as the preface tells us, to furnish those who contemplate entering the electrical engineering profession, with information as to the steps by which they must proceed if they would carry out their intention. And here we might remark on the unfortunate grammar of the sub-title to the book, it surely should run, "Electrical Engineering as a Profession: How to Enter it. A Guide to the Engineering Profession." The present is the third edition of the book, so that it obviously supplies a want generally felt by the public. This is now termed the "official" edition, because the publication is "now officially recognized by many of the leading technical colleges, &c." And that being so, it is to be assumed that the information afforded is correct. The work is intended as a guide to students and their parents, and there is no doubt that the electrical engineering profession is one in which many prizes are to be drawn in the future, nay, better than that, it is one in which for many a long day to come ordinary ability coupled with industry, will enable a man without capital or influence to make a decent living. This cannot, of course, be said of the older professions. The reason is sufficiently clear. For the older professions are crowded up, whilst the fields to be tilled by their workers are either not expanding at all, or doing so by very small degrees. Here is a field not only not overstocked but expanding by leaps and bounds. Twenty years ago the "electrical engineer" meant the telegraph engineer. Now there is telephony and electrical lighting, and many other applications of electricity to the arts besides the coming motor engines, whose productions will be run on rail or road, and on water. There is no end to the prospect before the right sort of student, the wrong sort will fail anywhere and in spite of any advice.

The present work tells on what lines the preliminary work of the student should be based, what assistance in the way of scholarships and such like are attainable by him, and what institutions he can go to. If he be a Londoner he will find here details of all institutions within reach. If he lives elsewhere he will only find matters concerning the most important in the country. Lists of fees payable are given as well as the facilities for practical teaching which the school enjoys. Then follow lists of certain engineering firms (general and electrical) who take apprentices. Here are given the terms and requirements and periods of apprenticeship.

Finally, there is given a chapter on electrical engineering societies. The whole shows the remarkable expansion which the profession has made in the past. The promise of the future is equally big. Mr. Southan shows the steps which the candidates must take to enter this inviting profession. But the fact of keen and increasing competition must not be lost sight of. It is no good to go in for this or for any other profession without the elements of success and the intention to work and work hard, to make a position and a name. To those with these simple qualifications the book will be invaluable, for it will show them how best to secure an opening where they may put their talents and their labour to the best possible account.

Photography and Photographers. London: Percy Lund & Co., Limited, 1896.

This little volume is the September issue of the *Practical Photographer*. It is a double number and is devoted to the subject of the development of the photographic art in Japan. We have, on previous occasions, referred to the wonderful way in which Messrs. Lund get up their publications. The present issue is well worthy of the reputation they have achieved for themselves. It has an inner wrapper—well preserved, as befits its delicate texture, from the chance of rude contact and handling on the bookstall or bookshelf. It is beautifully printed in colours on the craped paper characteristic of the Empire of the Orient. This alone would be well worth the sixpence charged for the volume. It is stated—and we can well believe it—that the execution of the number of these wrappers required for the issue took six months in the press, and that no less than twenty printings were required. The frontispiece is a marvellous group, quite characteristic of the country under treatment. The letterpress of the volume treats of the opening up of the country to European and American civilization, and shows how as soon as the outside world got in touch with the Japanese, that astute commercial people recognized, even in its then incomplete state, the value of the photographic art, even though their own methods of colouring and drawing had already achieved such remarkable perfection. The volume is chiefly devoted to an account of the advance of photography in the islands, and to a history of the men to whom that advance is due. But there are also some very useful recipes and hints for the use of Western photographers. The whole is well worthy of perusal, and the blocks and illustrations are of great interest and beauty.

Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—Ed. M. E.]

THE ATLAS METAL CO., LIMITED.

To the Editor of The Marine Engineer.

Dear Sir,—I beg to ask you to insert, for the information of your readers, that the Atlas Metal Co., Limited, carries on its business in Atlas Anti-friction Metal at 75, Queen Victoria Street, and has done so since the date of its incorporation. My company took over these offices from the partnership who traded as the Magnolia Anti-Friction Metal Co., of Great Britain, and my company has never had any dealings, nor is it in any way representing or interested in a company lately registered as a limited company under the title of the late Magnolia metal firm, and I have now to ask you to make this statement of fact as public as a certain notice which has been issued in your journal as to the new Magnolia Co. At the same time I beg to hand a circular descriptive of Atlas Anti-Friction Metal, and you will notice that this metal, unlike American Magnolia, with which I was formerly connected, is a British product, and that I guarantee that Atlas Anti-Friction Metal, although sold 40 per cent. cheaper than American Magnolia Metal, will give equal or superior results to Magnolia Metal.

I am, dear Sir,
Yours truly,
W. E. Watson.
Governing Director.

75, Queen Victoria Street,
London, E.C.

Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships, from September 10th to October 8th, 1896.

19949	T. J. L. Meyer. Propelling boats.
19982	G. Cooper and S. Fox. Steam boiler furnaces.
20016	H. R. Curry. Metallic packing for piston rods.
20017	C. W. Gauntlett and J. W. Hinton. Boiler indicators.
20023	F. Angus. Folding or collapsible anchors.
20039	J. L. Stout. Self-levelling berths for ships.
20043	F. O'C. Prince. Internal combustion motor.
20056	A. Mallock, Observing the rolling of ships.
20065	E. C. F. Otto. Metal tubes.
20083	W. W. Hughes and S. Willson. Generator
20087	J. von Grubinski. Purifying feed-water.
20105	T. Ashington and A. B. Spring. Detachable ships' cabins
20129	A. Bolton. Sight-feed lubricators.
20130	D., A., and F. Waddell. Assisting combustion of fuel.
20159	E. Berlan. Preventing ships sinking, &c.
20169	M. T. Johnston. Hatchway cover bulkheads.
20176	J. H. Lloyd-Verney. Lubricators and lubricating.
20191	A. Cryer and H. Baker. Valve for engines.
20203	J. A. and S. Fletcher. Low-water safety valve.
20204	P. Houston, J. Alston, and J. D. Murray. Steam boilers.
20235	A. G. G. Laabs. Motive-power engine.
20255	H. P. Anderson. Balanced slide valve.
20262	A. G. Melhuish. Engines.
20277	S. Pickard. Furnaces.
20304	T. H. Mew. Engine pistons.
20324	L. Matignon. Inflation of floating appliances.
20325	J. M. Barr and C. E. S. Phillips. Apparatus for packing piston pipe connections, &c.
20393	G. M. Schmid, E. J. H. Lesne, and A. Deflandre. Rotary engine.
20427	N. S. Keith and J. W. White. Raising sunken vessels.
20449	D. Smith. Lubricating cylinder pistons.
20470	W. L. Mitchell, jun. Admitting steam into cylinders.
20471	J. M. Newall. Boiler feed-water heaters.
20476	J. Roberts. Lubricating composition, &c.
20477	A. Brown. Sand suction dredgers.
20495	H. W. Metcalfe and W. O. Smith. Speed indicators.
20503	T. H. Edwards. Water-tube or tubulous boilers.
20514	C. A. Jensen. (The Actie bolaget de Lavals Angturbin. Sweden.) Packing shafts.
20515	J. Casey. Mariners' compasses, &c.
20535	T. D. Wilson and W. E. Baker. Speed indicators.
20564	G. Cockburn. Pressure reducing valves.
20592	J. and J. Seedhouse, jun. Steam generator.
20613	J. Ball. Fishing nets.
20628	T. Connor. Roller ship or vessel.
20652	D. McK. McKinlay. Using tidal rise and fall.
20668	J. C. W. Kjelgaard. Lubricators.
20674	H. K. and E. K. Scott. Embarking ladders for ships.
20746	J. Hardill. Steam engines.
20755	C. Bilton. Lubricating composition for bearings.
20759	A. W. Southey. Internal combustion engines.
20776	F. A. Small. High-pressure taps for water or steam.
20781	A. Smith. Lubricator.
20858	A. W. R. Berr. Rotary engines, pumps, &c.
20861	R. Baird. Gear for bulkhead doors of ships.
20896	A. B. Cunningham. Life-saving communications.
20908	S. Quincey. Rotary engines.
20909	F. E. Shean. Raising sunken ships.
20914	M. F. Ross. Piston.
20926	S. E. Alley. Speed governors for motors.
20927	T. and W. H. Smith and W. Eastwood. Steam engines.
20943	J. Kay. Trawlers.

20952 A. Bradshaw. Steam traps.
20972 G. W. Price. Propelling vessels.
21007 W. D. Forsyth and E. T. Bell. Removing scale from boiler tubes.
21029 D. B. Morison. Water gauges.
21053 N. Macbeth. Friction clutches.
21063 A. B. Brown. Steering machinery.
21073 J. Pennifer. Gauge glass protectors.
21076 T. J. Haslam. Governor to control engines.
21082 C. Simmons and R. A. Bruce. Steam engines.
21083 A. E. Seaton. Water-tube steam boilers.
21092 R. E. C. Shann. Steam generators, &c.
21109 J. Boyd. Disengaging gear for ships' boats.
21121 H. F. Smyth. Screw propellers.
21125 W. F. and S. Snowdon. Securing non-conducting coverings.
21157 W. Rowbotham. Steam engines and boilers.
21159 H. Johnson. Recovering goods from sunken vessels.

HOAR & BROWN'S HARDWOOD MARKET REPORT, OCTOBER 23rd, 1896.

TEAK.—	Timber. Loads.	Planks. Loads.	Blocks. Loads.	Total. Loads.
Stock, 1st Oct.	8,754	2,340	112	11,206
Landings	396	18	—	414
	9,150	2,358	112	11,620
Deliveries	927	229	10	1,166
Stock, 16th Oct.	8,223	2,129	102	10,454

There has been a fair demand, and holders display greater firmness. The outlook shows no sign of any decline in values, and speculation is becoming restricted at the advance. Some large sales have lately been made at satisfactory rates, and cheaply-purchased stocks are now mostly cleared off the market. Retail prices rule very high.

Planks also have further advanced, and business upon a large scale is getting difficult. The month's deliveries, so far, show well against the quantity landed.

MAHOGANY.—*Tobasco.*—Medium sizes are selling well. The larger wood finds a keen competitor in African importations, and prices are consequently not so well maintained. *Minalitlan.*—Arrivals have consisted largely of the minimum class, which is not much sought after, and difficult to place. Larger sizes are selling better. *Tecolutla.*—Little of this now remains in first hands. The cargoes lately to hand have tried the market, and brought prices down slightly. *Honduras.*—The demand for the first new shipments was shown by the high values paid at public sale, where the competition was very keen. *Nicaraguan* wood, which continues to arrive in small consignments, appears to realize its value, and the demand increases. *Panama.*—Stocks being light, there is little doing, and good, sound logs are much wanted. *African.*—A large quantity has lately gone into consumption, the sizes given for the money being much larger than in any other qualities. *Cuba.*—There has been a slight decline in minimum prices, but sizeable logs are still much required. *Spanish.*—Requirements are very small, and some cheap sales have lately been recorded.

WALNUT.—Logs have been coming forward in large quantities, consequently parcels are offered low, quotations almost touching the late panic figures. Good boards and planks are selling well, but stocks are large in the low class stuff, and values low.

WHITEWOOD.—The demand for logs is small even at reduced prices, and boards are required to be offered very low to tempt purchasers. The fact of freights having advanced will, no doubt, cause an improvement in this business.

GREENHEART.—There is considerable stock, and more business has been done of late. Prices are firm, with a prospect of advancing.

KAWRIE PINE.—Stocks are ample for the present quiet trade. Prices rule low, and a hand-to-mouth business only is being done.

SEQUOIA.—The market is almost bare. Inquiries are not numerous, and a large cargo is daily expected here.

Business in many classes appears to be looking up, possibly owing to the advance in values abroad, and in consequence of *the general rise* in the freight market.

BOARD OF TRADE EXAMINATIONS.

NOTE.—1C denotes First Class; 2C, Second Class.

September 26th, 1896.

Adam, W. H....	1C	Aberdeen
Bjorkman, A...	1C	N.Shields
Brown, J......	1C	"
Burnop, J.	2C	S'nd'land
Cameron, H. R.	2C	"
Carter, T.......	1C	"
Cruickshanks, G.	2C	London
Cumming, G. P.	1C	S'nd'land
Duguid, R.	2C	Aberdeen
Gibson, David..	2C	Liverpool
Green, C.R.....	2C	N.Shields
Howard, W....	2C	"
Jervis, H. W....	2C	London
Jones, E. J.....	1C	Liverpool
Leach, J. H. S.	2C	S'nd'land
Macris, C......	2C	"
Mathews, J. E. .	2C	London
Meldrum, H. ..	1C	S'nd'land
Noal, F. W....	1C	"
Purves, R. J. ..	1C	Liverpool
Sharling, C. C. .	1C	London
Stewart, J.	2C	Aberdeen
Taylor, F. J... .	2C	S'nd'land
Turnbull, F.....	1C	N.Shields
Wells, F.	2C	Liverpool
Wilson, P.	2C	S'nd'land
Young, W. H. ..	2C	"
Younger, R....	1C	Aberdeen

October 3rd, 1896.

Allingham, T. N.	2C	London
Avery, J. C.....	1C	Liverpool
Bowen, J. D. ..	1C	"
Boyd, J.	2C	Glasgow
Browne, A.....	2C	Cardiff
Butter, W. C. D.	1C	London
Carey, R.......	2C	Liverpool
Chapman, A. E.	2C	London
Cummins, J. ..	2C	Liverpool
Dowler, W.E...	1C	"
Ellerker, C. P...	1C	London
Fyfe, S.........	1C	Glasgow
Fox, T. F..... .	1C	Cardiff
Gibson, W. E...	2C	London
Greene, J......	2C	Cardiff
Grey, W.......	2C	N.Shields
Hall, J.........	2C	Glasgow
Hewens, E. E. .	2C	London
Hoare, J. E....	2C	Cardiff
Hughes, R.....	1C	Glasgow
James, C. E... .	2C	Cardiff
Jarvis, T. H... .	2C	"
Johnston, W. A.	2C	Glasgow
King, J. C.....	1C	"
Kirkpatrick, H.	2C	Liverpool
Lawrence, J. ..	1C	Glasgow
Leatch, A..... .	2C	Cardiff
McAlister, R. ..	1C	Glasgow
McCash, J.	1C	"
McCullock, D...	2C	"
McDougall, C...	2C	"
Melville, W. N.	1C	Liverpool
Morgan, J.	1C	Cardiff
Murray, J.	2C	London
Nicholls, G. A. .	2C	Cardiff
Ramsey, J. C...	2C	Glasgow
Salmond, D... .	1C	Liverpool
Selby, F. H....	1C	London
Smith, S. H....	2C	Liverpool
Stephens, D. W.	2C	Cardiff
Thomas, M. G. .	2C	"
Thomson, A....	1C	Glasgow
Weatherill, E..	2C	N.Shields

October 10th, 1896.

Abey, W.	2C	N.Shields
Allison, J.......	1C	London
Batey, R. W. ..	2C	N.Shields
Berry, T.	2C	"
Buchanan, A. ..	2C	London
Caise, D. F.	2C	"
Clark, W. H. ..	2C	"
Cole, A. T.......	1C	"
Darnell, A. W	1C	N.Shields
Davis, F. D.....	1C	Hull
Duffy, J.	2C	N.Shields
Eggers, W.	1C	Leith
Furneaux, W...	2C	London
Galtrey, A. E..	2C	Hull
Griffiths, John R.	1C	Liverpool
Hewitt, James G.	2C	"
Laird, G. M. ..	2C	London
Lambert, J.	1C	N.Shields
Metcalf, G. E...	2C	Liverpool
Milne, J. J.	2C	Leith
Mussored, C. B.	2C	London
Myhill, J. E. ..	2C	"
Raahauge, S. A.	1C	Hull
R evell, James H.	1C	Liverpool
Ritchie, A. J. ..	1C	London
Roach, R. C. ..	2C	Hull
Scougal, A.	1C	Leith
Soulsby, T.	2C	N.Shields
Stephenson, W.J.	2C	"
Sutherland, H...	1C	Liverpool
Thompson, T. E.	1C	N.Shields
Watson, D.	1C	"
Wilson, Thomas	1C	Liverpool
Young, W. E. ..	2C	N.Shields

October 17th, 1896.

Anderson, A. G.	2C	N.Shields
Atkinson, C. K.	2C	Liverpool
Bennet, J.......	1C	Greenock
Critien, H.	1C	London
Dick, J. L.	2C	Greenock
Diggle, Henry J.	1C	Liverpool
Fleming, C. M.	1C	London
Forrest, R.	1C	Greenock
Hampson, R. ..	2C	N.Shields
Hopper, A.	2C	Greenock
Hughes, R.	2C	Liverpool
Macfarlane, A..	1C	Greenock
Maddison, J. W.	2C	N.Shields
Manson, J. W...	2C	"
Marshall, J.....	1C	Greenock
McGrow, J. W.	2C	N.Shields
McVeigh, W. H.	1C	Dublin
Pierce, R.	2C	"
Smith, M.......	1C	Greenock
Sumner, O.	2C	Dublin
William, D. J...	2C	Liverpool

Messrs. John Penn & Sons.—The eighth annual dinner of past and present members of the drawing office of Messrs. John Penn & Sons will be held on November 7th, at 7 o'clock, at the Holborn Restaurant. The chair will be taken by A. Blechynden, Esq., the managing director of the company. Applications for tickets should be made to R. W. James, Esq., 1, Queen Victoria Street, London, E.C.

[REGISTERED FOR TRANSMISSION ABROAD.
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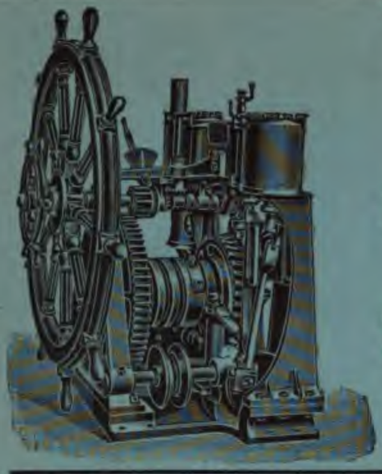

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MARINE ENGINEERS

WRITE

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The Marine Engineer.

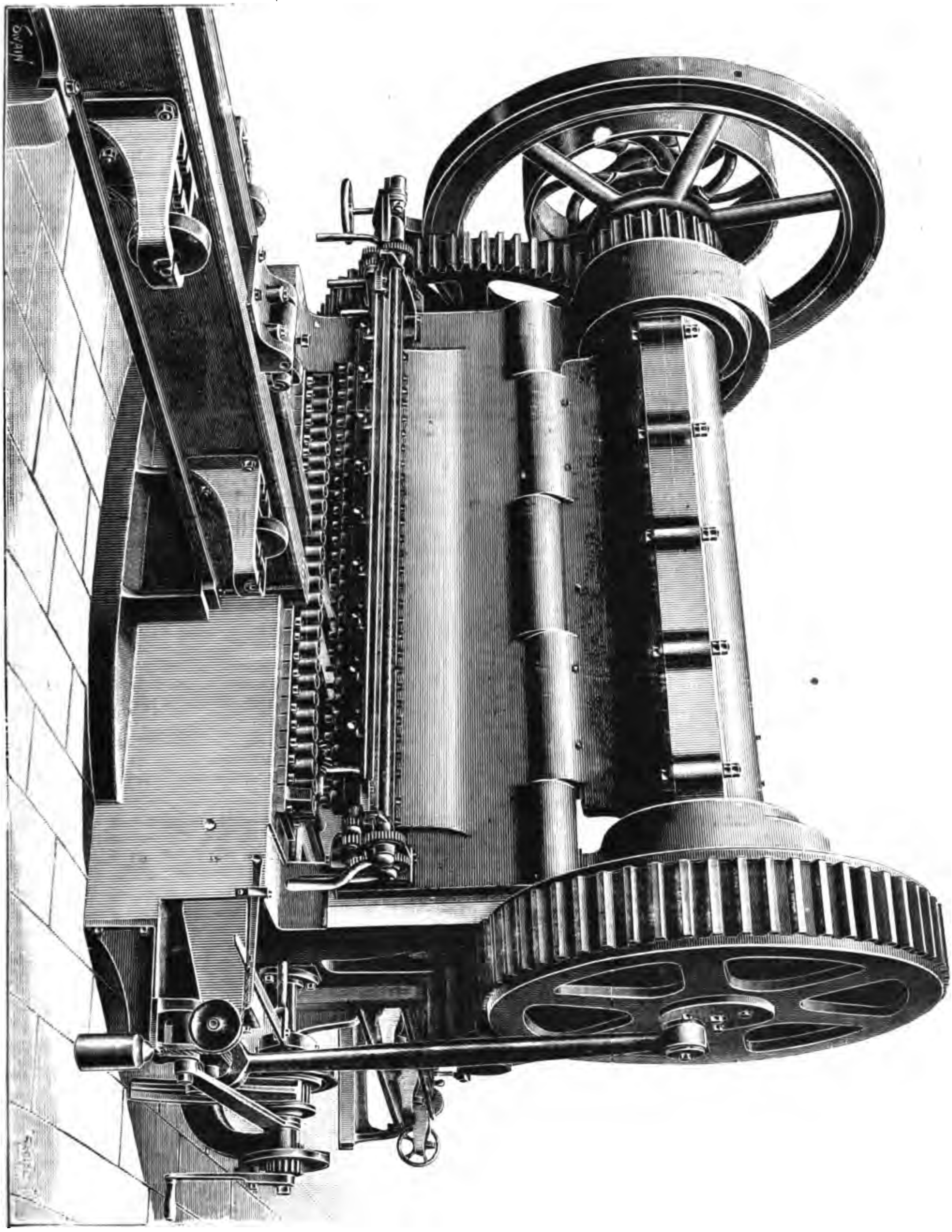
LONDON, DECEMBER 1, 1896.

THE ship-master, according to the Ship-masters' Society, is of all professions the most hedged about by legal requirements, disabilities and duties. The law is concerned with the ship-master from the first step in his profession to the grave. He can only have the right to carry on his business or profession by virtue of a legal permit. So soon as he assumes his legalized position he has peculiar liabilities in his dealings with the crew and others as the sole representative of the owner so soon as he leaves the home port. He therefore has a maritime lien enforceable in the Admiralty Court against ship and freight for unpaid wages, and for disbursements on ship's account. On the other hand, the master must not trade on his own account or receive premiums or commissions on transactions on behalf of the owner. He is virtually the owner himself when abroad on the high seas, and can in his own name maintain an action on behalf of the ship, or even hypothecate or sell it on behalf of the owners. Of course the universal introduction of the telegraph cable and regular agents of the owners in usual ports of call much relieves the master as to any occasion from using the power vested in him without consultation, but the power is still legally there. In the case of the relations of the master to the sailor he engages, the master is personally responsible for his contract and for wages under it, even though he himself is merely interested in the adventure to the extent of his salary, and though that may be unpaid. He is responsible also for their food and medicine, and he is bound under penalties to allow persons appointed for the purpose to come aboard and record the ship's draught, or to survey the vessel when the seamen allege that she is not in a proper condition to go to sea. By recent Acts, his liability for imperilling the life of a seaman by wilfully taking a ship to sea, which he knows to be unseaworthy, has been created a criminal offence, though he runs the same risk as the seaman. The master is obliged to bring his men back to a home port, unless discharged for good and sufficient neglect of duty, in which case the British Consul is the referee. He is also under statutory obligations to bring home distressed seamen to a certain number, according to the tonnage of his ship upon the requisition of a British official abroad, and he becomes administrator for the property of men dying in the ship's service. Absolute control of the actions of both passengers and crew is vested in the master at sea, subject only to masters' orders being held to be reasonable on enquiry thereafter. The master has the power for enforcing discipline to deprive the offender, whether seaman or passenger—of his liberty, and to cause forfeiture of wages of the crew should he think it necessary as penalty for disobedience, wilful damage, or desertion. The master's duty to the cargo is a delicate position, as he may have to represent and consider in emergencies, the interests, both of the shipowner and the cargo owner, and he must hold the balance of interest as evenly as he can, even to disposements for the saving of the cargo, or the selling of it on his own responsibility, to save what he may think further loss if he attempted to carry it to its destination, or he may jettison any part or the whole of the cargo to save the ship if he considers it necessary. It would appear to us that the master to be properly informed as to his duties under any possible emergency, must be a perfect compendium of Acts of Parliament, but it would appear that the whole various obligations may be compressed into the dictum that he must have exceptional good common sense, and is absolutely empowered as an autocrat to do that which appears to him to be the best for the lives, safety and welfare of the various human beings, ship and cargo, entrusted to his care. It is well perhaps for us all to remember, whilst the rapid strides and importance of engineering and engineers in the Marine are so much on the increase and demanding constant attention, that the legal responsibilities and business ability of the captain or master are no sinecure, and demand great shrewdness, rectitude, and ability to properly execute them under all circumstances of emergency.

GREAT BRITAIN is apparently not to be the last of the powers to have a reliable submarine torpedo boat. Allan's submarine boat has been taken up by a Naval Defence Syndicate, as the trials upon the model have been so satisfactory, and we understand that a boat of practical size to contain a working crew is soon to be launched or rather submerged. The various inventors who have united their science and intelligence to deal with the various problems of how to submerge a boat at a definite depth and keep her there whilst travelling a definite course; of how to propel such a vessel without a discharge of smoke, or exhaust into the atmosphere or sea; how to steer her without a compass; and how to live within her for a lengthened period without fresh air, are confident that they have at last completely solved these very difficult problems and that their boat, when launched, will fulfil all the requirements of a sea-going torpedo boat capable of attacking, fleeing, or lying in wait under the water quite submerged for a very lengthened period. Though this will be a triumph of engineering, electrical and chemical skill, we fear that this will only be an added terror to the future naval conflicts, and as it has been said that the ultimate cure of human strife and wars will be the application of engines of destruction too terrible in their effects to be contemplated, it would appear that a considerable stride has been made in this direction in naval warfare by the invention of a practicable submarine torpedo boat.

MESSRS. YARROW & Co. are as busy as ever with orders for Foreign Governments, and it would appear that they are still breaking records on their previous productions, as we understand that one of their latest boats, the *Corrientes*, built for the Argentine Government, has actually accomplished 27·4 knots, though carrying light armour plates about the engine-room to protect the engineers and stokers against small-arm fire at any rate. This additional security will, no doubt, assist these men to devote their undivided energies to the steaming capacity of the engines and boilers in times of emergency, and has apparently been obtained without any loss of contract speed and even with a better result in this respect than had been expected. There are four of these destroyers being built off the same design, and in all these the Yarrow automatic feed has been fitted and has been found to work admirably. The consumption of coal is only from 2 to 2¼ lbs. per I.H.P. per hour, which compares very favourably with that of other destroyers built for the British Government. It is believed that a speed of 27 to 30 knots is ample for any destroyer, and that any higher speed than this is obtained at high cost, and at the sacrifice of other valuable qualities.

CAPTAIN M. J. BUTCHER, of the Shipmasters' Society, is evidently gifted with great powers of observation and with what is perhaps better, the power to group and set down the results of such observations, and the lessons to be learnt from practical experience. Seeing how many may be the variety of construction and fittings of steamers that come under the observation of masters in their daily life and experience, it would be well if all such recorded their personal appreciation or otherwise of such arrangements as have come under their notice, and also take care that such records are published in such a way that shipowners and builders could profit in future designs, constructions, or fittings from the actual experience of those who have to use them. Captain Butcher has a large number of suggestions to make as to the best mode of carrying out the accommodation of officers and crew, the nature of the fittings that give greatest comfort and sanitary enjoyment, and the most suitable arrangement of means for handling cargo, both as to derricks, hatchways, and cargo ports. Our space will only permit us to refer to a very few of his suggestions and hints. As to hatch coamings and their fittings, any height above 2 ft. 3 in. at sides, to 2 ft. 9 in. amidships would appear to be inconveniently high. The large hatches for a steamer of say 4,000 tons gross, should be about 26 ft. by 15 ft., and Nos. 1 and 4 about 18 ft. by 15 ft. The large hatchways should be divided into three parts with fore-and-afters fitted, so that each division can be closed separately, so that one may be used whilst others are closed, as is very convenient in showery weather, and the plates are easy to handle. Much improvement is to be desired in the usual method of securing tarpaulings on iron coamings. The ordinary iron cleats spring with the wedging, and either a stiff cast-steel cleat should be used, or it is recommended that the cleat should have a shoulder turned inside, whilst the batten has a small flange or shoulder along its lower edge. When the wedge is inserted between these shoulders and between the cleat and batten, neither the batten nor the wedge can rise, and the fastening is a very secure one. Gangway doors are recommended all in one piece, hinged on the lower edge, and opening inwards down to the deck, as they present no difficulty in handling when lying close alongside a quay wall or other vessel. The hinge bolts may be of brass held with a screw nut, so that they can be readily withdrawn and the doors removed clear out of the way when desired. Cargo ports appear to be a necessity in a vessel so large as 4,000 tons, although owners and superintendents set their face against them, but some vessels actually lose coast employment for want of them. One on each side in each compartment between decks are recommended, hinged on the upper side to keep them from being damaged when opened by lighters lying alongside. Such cargo ports should have at least an inch lip or overlap to ensure proper packing to make them watertight. Less than this lap, as is often the case, render them unsatisfactory. The port also should be stiffened at the corners to prevent the closing bolts from springing out the corners and thus making them leak; it is well also that the closing bolts should be made with shoulders to check undue and excessive strain upon the doors. Three feet by two feet in the opening is reported to be a good size for general purposes. In the matter of boats Captain Butcher considers the 28-ft. lifeboat too heavy and awkward for the small deck crews of the present day, and instead of two 28-ft. boats, recommends four 26-ft. boats. These are much lighter and more easily handled in



An Improved Multiple Punching Machine. (*See page 348.*)

every way. The boats should be placed in chocks plumb under the davit heads, and so arranged with the outer chock cut three or four inches deeper than the inner one, and hinged on long bolts so as to turn down, leaving the boat clear to swing out on the tackles. These and many other details recommended by Captain Butcher may appear trivial, but it is on the convenience of such details that the comfort, and very often the lives, of the crew may depend in an emergency, and it is for the masters, with their practical experience of use at sea, to guide the framing of specifications for such details, and Captain Butcher deserves well of the community for the record of his observations upon such fittings and their convenience or otherwise.

THE Institute of Marine Engineers are about to celebrate their present session by a conversazione, upon the 4th of December, at the Town Hall, Stratford, the programme for which is now before us. There will be no lack of entertainment for mind and body, as the conversazione and ball will last from 6 p.m. to 2.30 a.m., and comprises not only organ recitals and instrumental and vocal music before the dancing, but also the Presidential address by Sir Edwyn Sandys Dawes, which intervenes in the midst of the musical entertainment. This is a strange conjunction of amusement and more serious business. We hardly think it a compliment to the serious and important matter of the President's address to insert it in juxtaposition to lightning sketches and humorous duets, nor can we conceive that the audience will be in a sufficiently serious frame of mind to fully appreciate such an address for the period of half-an-hour. We can well imagine a President desirous of reducing his formal inaugural address, which is often a tax upon him, to a mere congratulatory speech on such an occasion when he meets the mass of the members for the first time, and such a course would have been quite *apropos* to the occasion, but a serious written address upon important matters is usually given a special business evening to its reception and consideration.

MULTIPLE PUNCHING MACHINE.

MESSRS. DE BERGUE & CO., LIMITED, of Manchester, have recently completed an improved multiple punching machine, for punching at one setting the large steel plates of the pontoons required for the new floating dock at Barcelona, which we illustrate on page 347. The maximum size of plates the machine will take in is 25 ft. long by 6 ft. wide, the width between the main standards being 6ft. 6 in. The plates in this special case are 18 ft. by 5 ft. 10 in. by ½ in. thick, and are punched all round the edges in addition to several lines of holes across. The maximum number of holes per stroke of the machine (which makes twelve strokes per minute) is 12, ⅞ in. diameter, through ½-in. steel plates — the machine being fitted with thirty adjustable punches and dies. The plates are first marked with a centre line down the middle, longitudinally, by means of a string and chalk, and are indented with a centre-punch about ⅜ in. from each end. The plate is then lifted on to the bed of the machine in front of the punches and is gripped by the pointed grippers of leading and trailing carriages sliding on long planed beds. The plate, is then drawn by a fine hand adjustment in the leading carriage into the correct position under the punches for the first row of holes in the end of the plate consisting of twenty-eight holes, and two on each side of the longitudinal seam, in all thirty holes, the punches having been previously set to the correct cross pitch, which in this case is 2½ in. The punches are arranged in three groups, the two outside double punches being independent of the rest, while the groups are controlled by independent stop levers. The punching is started by means of one of the levers at the side of the machine and the first group of eight punches with the two double independent punches are thrown into gear, twelve holes being punched at the first stroke. By another movement of the lever nine more holes are punched at the second stroke, and at the third stroke the row is completed by punching the remaining nine holes. The holes in the end of the plate being now completed, the punches are all thrown out of gear, except the end double punches. The automatic traversing gear is then thrown into gear and the plate automatically moved by means of a guide screw and change wheels to any desired pitch under the punches, which punch two holes at every stroke 2½ in. pitch along each edge of the plate. The machine automatically traverses the plate and punches the longitudinal edges to the correct pitch until the next cross line of holes is reached, when the attendant throws the automatic feed out of gear, whilst the cross line of holes is punched in the same way as the first one described above. The automatic traverse is then thrown into gear again until the next cross line of holes is reached, and so on till the plate is finished by punching the holes in the trailing end of the plate as before described. The work is thus completed—the machine running continuously during the whole operation—the punching being completed without missing a single stroke of the machine.

To give an idea of the output of this machine a plate 18 ft. long by 5 ft. 10 in. by ½ in. thick, having 308 holes is punched in 3½ minutes, and the machine will turn out 100 tons of punched plates per day.

It should be borne in mind that no templates of any kind are required, and the punching is done with an absolute exactitude that is quite unattainable by hand work, so much so that a number of punched plates may be stacked together and a rod dropped through the holes at any point. The traversing gear is so arranged that holes of any irregular pitch may be punched at any desired place in the plate, and any single punch, or any desired number of them, may be operated independently of the others, each punch being fitted with a separate stop motion.

The weight of the complete machine is 22 tons.

BALANCED PRESSURE VALVES; A NEW SPHERICAL BALANCED VALVE FOR ALL PRESSURES.*

By JAMES CASEY, Consulting Marine Engineer.

THE object of the present paper is to bring before the members of the British Association the avoidable loss of life and damage to property caused through explosions of defective valves, and to elicit the opinion of those members who are conversant with, and use high pressures, whether of steam, water, or other fluid, or those who are responsible for the introduction of extreme pressures in valves or boilers.

Up to the present time the steam valves generally in use have been of the lid type, having screwed spindles. The valves being loose on the spindles clatter each time the steam is admitted to the engines, and the terminal, intermediate and boiler valves are all subject to this incessant action. The valve spindles are often broken, and both valve and seatings damaged to such an extent that they have to be renewed, and when broken no means are afforded of closing the steam off the boiler in the event of the steam pipes bursting or an accident to the machinery. When the valves are screwed down in the seatings, and the boilers are allowed to get cold and steam is again raised, it is sometimes impossible to move them, and the spindles are often wrenched off in trying to get them open—in some cases the valve box bursting. The same thing happens in the case of steamers on a long voyage when the valves have been standing any length of time; the screws get corroded, and in case of accident the valves cannot be moved. The practice then is for the engineer to get an iron bar to start them, with the result that the spindle end is frequently wrenched off, and the valve is useless. As a rule, valves, especially for steam purposes, are unbalanced. Where a valve is termed an "equilibrium valve" the same type is employed, viz., a smaller size valve taking the initial pressure in order to assist the final operation during the time of opening the large valve, the one spindle carrying both valves. The valve and seatings are all of brass, and the expansion of this metal being more sensitive than the cast iron forming the valve chest causes the valve to jam, and in many cases water that has passed into the valve box and steam pipe from the boilers causes additional danger and even fatal results—often attributed to defective steam pipes—whereas both valve box and pipes are charged with water from the steam leaking and passing into the main steam pipe and getting condensed into water. No means are afforded under the present valve system of draining this water, and hence it happens that the moment the stop valves are opened on the boilers full to the engines a hammering takes place, the explosion immediately following.

From the design of these valves, I do not see how it is possible for a satisfactory drainage to be applied that can be always available, and keep the steam pipes free of water and of the danger to which I have referred.

The alternative practice adopted in order to prevent the pipes exploding has been for the British Admiralty to lap the pipes (main steam) with three strands of wire, whilst in the mercantile marine iron bands are fitted on and around the main steam pipes at short spacing. Others lap the pipes with steel wire, which is a very expensive makeshift, and, from a scientific point of view, very doubtful engineering.

These precautions I consider are unnecessary and uncalled for if suitable valves were fitted, inasmuch as it has been proved that the bursting of the pipe does not arise from steam pressure alone, but from steam and water pressure combined at one and the same moment of time. The condensed water in the steam-pipe acts as an hydraulic force, and with the steam suddenly let in, the combined forces are more than the pipes can withstand. As there are no satisfactory means provided for draining condensed water, the explosion occurs as a matter of course. This condensed water could be drained from the pipes if suitable valves were adopted, leaving the steam pipe essentially a steam pipe, and not one containing a combination of water and steam. The frequent bursting of main steam pipes is an occurrence not confined to our own industries, but those of other nations equally suffer. For instance, the German Government, in consequence of the bursting of the main steam pipes and valves of their war vessels, recently made experiments to determine the causes of steam pipe explosions, it being found that in most cases these have taken place while steam was being admitted into the engines.

On this supposition specific tests (according to an official report) were made. From the report it will be seen (Appendix A) "destruction of a completely drained, although entirely cool, pipe cannot occur, whether the stop valve near the boiler under steam is opened gradually or in a sudden careless manner, because hammering, which alone can cause an explosion, does not follow. But it is to be observed that a rapid filling of the pipes may prove disastrous, for the sudden heating up of the various parts may cause rupture, due to unequal stresses on and resistance of the material." Experiments detailed in the report demonstrated that in one instance, when the stop-valve was three-fifths open—the pipe being filled with water and with the aid and drain cocks open—the threads of four nuts on the securing bolts in the end flange were sheared off, the flange itself was much bent, the gauge tapped into it destroyed, and the pipe in the neighbourhood of this flange bulged outwards. The pressure shown by gauge I. was 483·5 lbs., by gauge II. 384 lbs., and by gauge III. 924·5 lbs., and under other conditions the pressure was still higher and the rupture more severe

As showing some of the results arising from defects in the existing system in connection with boilers, steam pipes, and heating apparatus in public buildings and places of business, I have given in Appendix B particulars derived from Board of Trade reports of official enquiries under Act of Parliament. These illustrate the nature of explosion in mills, factories, on board ships, &c., and clearly point to the necessity of a new departure in the valve system if the present destruction of life and property is to be obviated. Mr. Ingram B. Walker, in his report to the Board of Trade for the twelve months ending June 30th, 1895, states that 43 persons were killed and 85 injured by boiler explosions—more than in any year since the Boiler Explosions Act of 1882 came into force. There were 27 cases due to explosions of boilers used for heating purposes, probably caused by the freezing of the water in some part of the apparatus. What I hope to show is that this apparently "natural cause" need no longer apply.

The importance of having reliable valves under extreme pressure, whether for steam, water, or other fluid cannot be overestimated. Having regard to this, I have designed a valve of globe form which I may say with perfect confidence is balanced under all or any pressure. The limit of its working is the resistance of the material composed in its construction. I have here drawings and models which show the practical working and novelty of the new system. The valve forms a complete sphere with an opening in same at right angles to each other with spindle cast on working in a fixed and adjustable seating, and so arranged that the pressures are balanced or equalised, and friction is reduced to a minimum. This sphere is fitted into a valve box, sometimes made in two parts for convenience in adjusting the sphere and its seatings, such being adopted to allow for contraction and expansion under pressure. Suitable openings are formed in the valve box corresponding with those in the globe, so that when the globe is turned by its spindle to the required position the same may be turned off or on. The openings in the valve box and in the sphere respectively are arranged to correspond with the full supply of steam, water, or other fluid.

The globe or ball is perforated with a small passage corresponding to a similar passage in the valve casing, and when opposite to each other any condensed steam or water escapes from the steam pipes or valve either to the condenser or runs to waste, thereby effectually clearing the pipe of water and preventing any chance of explosion.

When opening, this form of valve does not require to be drawn off its seating, consequently it is at all times open to the full pressure of the steam in the boiler. The steam gains access between the ball and the casing, whereby the inner and outer surfaces of the globe in contiguity with the spaces are equalised. In order to equalise the pressure on the segments or seatings a passage is formed in the ring. The space above the ring is in communication with the passage by means of an opening formed in the casting (or an external pipe may be fitted for the same purpose). This valve can be used for the combined purposes of a steam and throttle valve in one, and a spring is inserted to keep the adjustable ring down on the ball at any required pressure.

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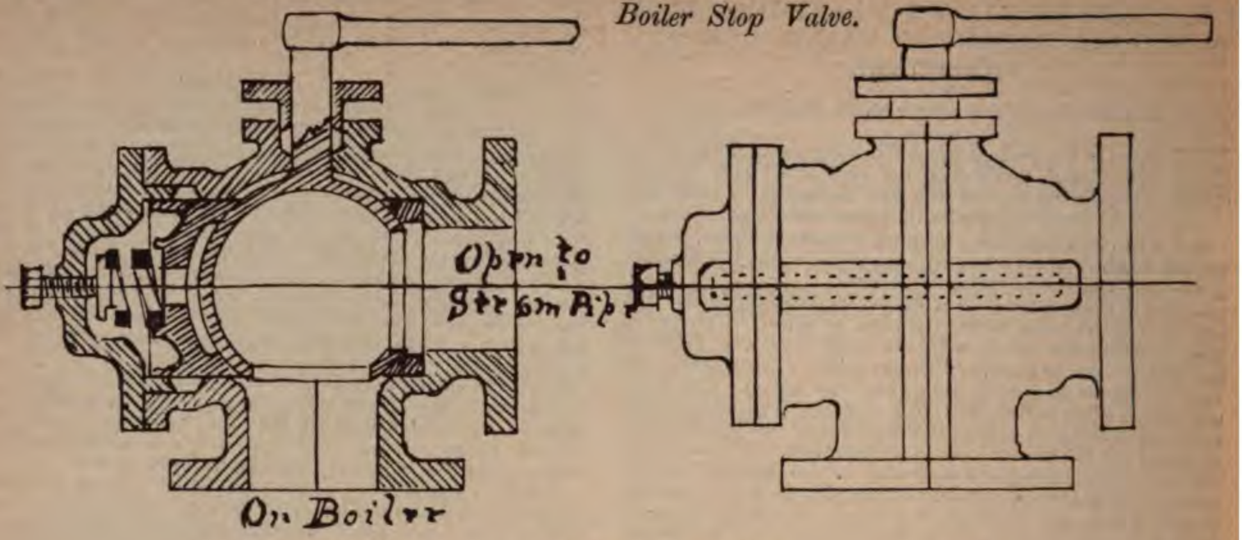
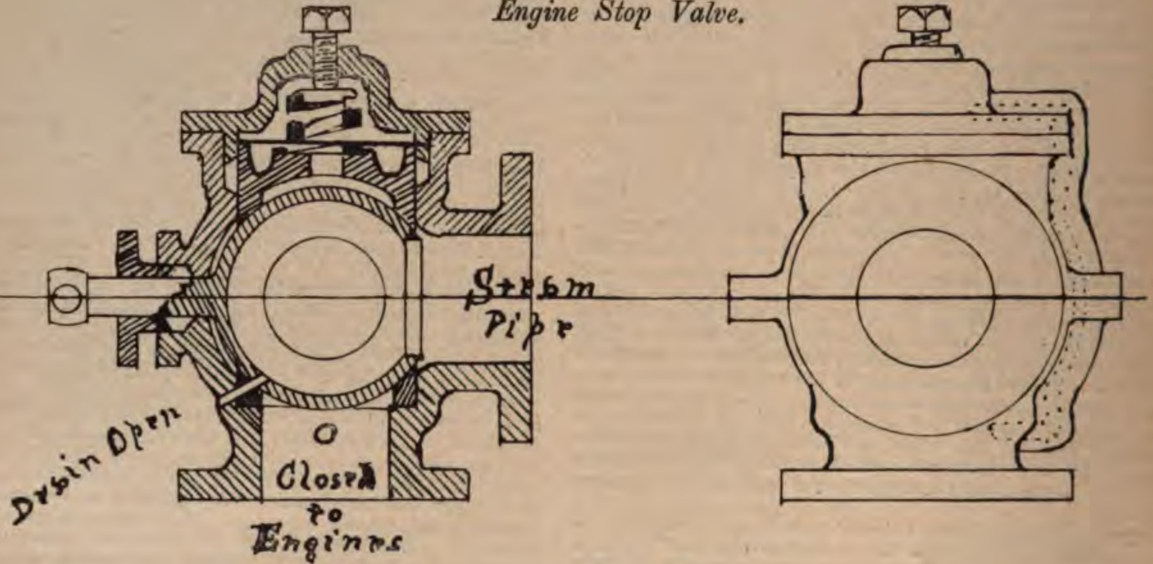
* Paper read before Section G., British Association, Liverpool meeting, 1896.

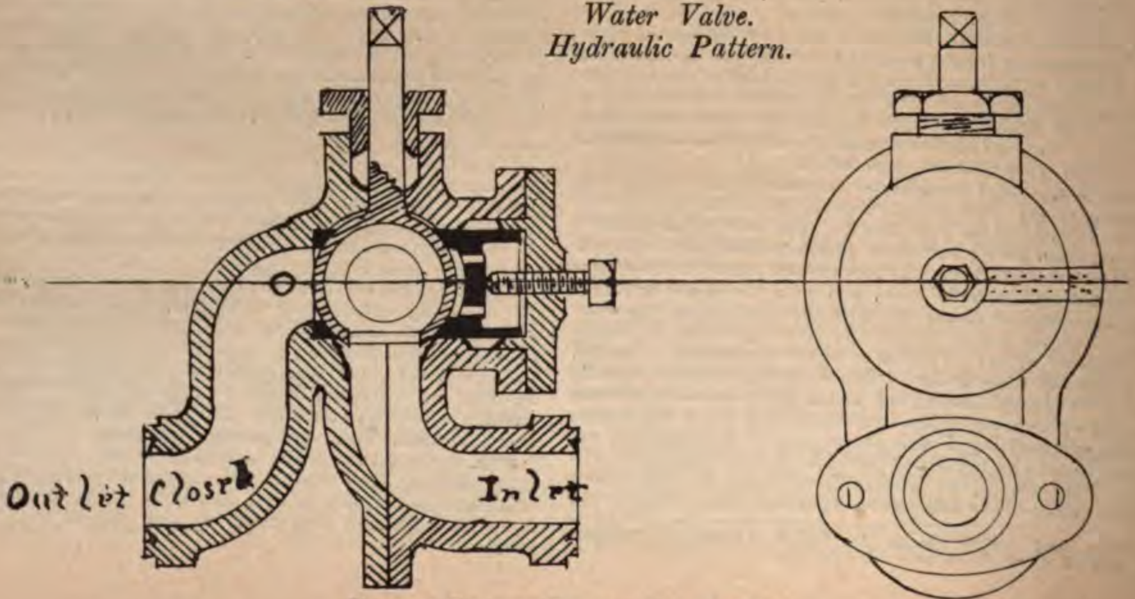
Boiler Stop Valve.


Open to
Steam Pipe
On Boiler

Engine Stop Valve.


Steam
Pipe
Drain Open
O
Closed
to
Engines

Water Valve.
Hydraulic Pattern.


Outlet Closed
Inlet

Balanced Pressure Valves. (See page 349.)

In applying this valve to hydraulic machinery the adjustable ring is kept in contact with the globe ball by a gunmetal or other non-corrosive regulating screw. The valves are opened and closed by means of a spindle with a hand wheel lever or other appliance attached thereto. In the case of vessels requiring despatch, these valves being devoid of screw spindles, there is no necessity for vessels being kept in dry dock, whilst the valves are ground into these seatings as is the case at present. Days are often consumed whilst this operation is being effected.

Hydraulic Valves.

The present form of valve in use for ordinary pressure, say of 700 lbs. per square inch, is of the same type as those described as "Equilibrium valves" supplied to high steam pressure, and frequently the water used in those valves are charged with sandy and other foreign matter, so that when the valves are screwed down on the seatings any grit or sand is jammed between the face of the valve and seatings thereby causing frequent renewal. Above those pressures it is difficult to get a valve to stand, but with the new valve no grit or sandy matter can get between the valve and seatings for the simple reason that it works in and on the seatings and no foreign matter can be introduced. I may add that a valve on this principle has now been at work close upon 18 months and it has been found upon examination that it is as good now as on the first day it was put in place, and has not cost a penny for repairs or even adjustment, although in daily work at a pressure of 750 lbs. per square inch. In the use of higher pressures the limit of its working is the cohesive strength of the material of which it may be constructed and being balanced it is manipulated by a small lever which a boy can work.

The system which I have advocated possesses equal advantages in connection with fire hydrants and water supply generally owing to its simplicity and the ease with which it can be worked.

I would also draw attention to the enormous loss of life and property due to defective boilers and coils used for heating churches, chapels, and public buildings, and from Appendix B it will be found that the loss of life and property is increasing. The explosions are due principally to the water freezing and ice forming in the supply and discharge pipes in the heating apparatus after being in use. I do not hesitate to state that if these boilers and coils had been fitted with Globe valves directly on the heating apparatus and between the heating pipes in the buildings so that the upper valve when closed stops the feed supply, and the lower valve closed to the heater and open for draining the apparatus, no water would or could remain in to get frozen, and the water run out would be available for a future supply.

"APPENDIX A."

Experiments to Determine the Causes of Steampipe Explosions on Board German Naval Vessels.

The frequent bursting of steampipes has led to the investigation of the causes of these accidents.

In most cases the explosion has taken place while admitting steam into the pipe system, as, for instance, on H.I.M.S. *Siegfried*, March 18, 1892; on H.I.M.S. *Wacht*, June 20, 1889; on H.I.M.S. *Prinzess Wilhelm*, August 9, 1891; on the same ship on November 7, 1893, when a stop valve in the maim steampipe exploded; in a boiler plant at Ferranti's, Deptford, England, July 9, 1889; on the s.s. *Jumma*, December 13, 1890; in a boiler plant of the new mill in Zuellichau, near Stettin, Germany, in 1860, &c. From these examples the supposition arose that possibly water contained in the pipes caused water-hammer. On this supposition the following tests were made:—

(*a*) *Arrangement of the First Experimental Pipe.*—A pipe was taken consisting of two lengths, each 6·5 ft. long, 5·9 in. inside diameter, and 0·197 in. thick, and the ends tightly closed by flanges. To one of these flanges a 0·7874 in. stop valve was bolted in such a manner that the lower edge of the hole of the valve was in line with the inner side of the pipe, so that when the pipe was put in proper position the steam would enter at the lowest point.

To the other flange on the pipe a blow-off or water-drain cock 0·4724 in. diameter was secured, and in the centre of this same flange a high-pressure gauge (registering to 2,133 lbs.) with a maximum hand. Vertically above the drain cock an air cock was fitted, so that water could be blown off at the lowest, and air at the highest point of the experimental pipe. Later, a second pressure gauge was placed on the upper side of the pipe 22·83 in. from the flange, containing the steam inlet valve. The stop valve on the experimental pipe was connected by a 0·7874 in. pipe to a valve in the main steampipe of the machine-shop boiler, which carried a pressure of 70 lbs. The experimental pipe was inclined upwards from the steam inlet valve, so that if any water were present the steam would have to pass through it.

(*b*) *Arrangement of Second Experimental Pipe, and its Alterations.*—The second pipe was made up of parts of the old steampipe of the hulk *Bismarck*. It consisted of three pieces 12·2 in. in inside diameter and about 0·236 in. thick. Attached thereto were four maximum-pressure gauges capable of registering to 2,133 lbs., an air cock, and a water-drain cock, 0·7874 in. in diameter. This pipe was then connected by a pipe 3·15 in. in diameter with the main steampipe of the machine-shop, a 3·15 in. valve being inserted near the main steampipe. The first change in this pipe was the removal of that part of the pipe which was bent upwards and the insertion of a 1·97 in. stop valve to connect with the 3·15 in. pipe. After the bursting of this pipe near the flange opposite the steam inlet, and after the steam gauge on this flange had been destroyed for the second time, the damaged part of the pipe was cut off, the flange brazed on again, and the blank flange again secured in place minus the pressure gauge. The pressure gauge III. was then placed near this flange on the side of the pipe.

The tests made were as follows:—

1. Pipe *without* water, air cock closed and the drain cock open.
2. Pipe *without* water, air cock open and the drain cock closed.
3. Pipe *without* water, air and drain cocks open.
4. Pipe *without* water, air and drain cocks closed.
5. Vacuum in pipe and *some* cold condensed water formed by creating vacuum, air and drain cocks closed.
6. Vacuum in pipe, and the latter *filled with water* to about one-third of its cubic capacity, so that the point where the steam entered was under water in the first pipe, it being made to incline towards that point. In the second pipe the water filled the bottom of the pipe. Air and drain cocks were closed to one-third of their capacity at one end, and running to nothing at the other end.
7. Pipe *without* vacuum *filled with water* as under 6, air and drain cocks closed.
8. Pipe *without* vacuum *filled with water* the same as under 6, air and drain cocks open.

(A.) *With the First Pipe.*—Steam was admitted to the pipe to be tested by rapidly opening the stop valve on the main steam-pipe of the boiler, the influx of steam having been regulated beforehand by adjusting the stop valve on the flange of the experimental pipe. Beginning with one-fifth of the area of this valve, the opening was increased one-fifth in each of the succeeding tests. In order to get reliable results, the eight tests in the programme were repeated several times with the same valve opening.

In carrying out tests 1 to 4 no hammering in the pipe or motion was observed, whether the filling of the pipe with steam was retarted or accelerated. The pipe became heated, slowly or quickly, according to the rapidity with which it filled with steam, until it became thoroughly warmed and the pressure gauges on the pipe indicated the steam pressure in the boilers. As soon as a vacuum formed and a small amount of condensed water was present in the pipe (test No. 5), light hammering was observed when steam was admitted. This was not, however, indicated on the pressure gauges, but caused only a slight movement of the pipe. This hammering and the backward and forward movement of the pipe, became more intense the greater the quantity of water present (tests Nos. 6 and 7), manifesting itself in distinct blows and at shorter intervals, and causing the maximum hands of the gauges to indicate different pressures, varying between 128 and 242 lbs. Whether the vacuum in the pipe (test No. 6) had any influence on the action of the steam when it was admitted could not be determined by any of the trials.

The heaviest hammering, as well as the greatest movement of the pipe—which also continued for some length of time—were observed when the pipe was about one-third full of water and both air and drain cocks kept open (test No. 8), and for all five openings of the valve. During these tests there was a uniform discharge of water from the drain cock and of air from the air cock, for a longer or shorter time depending on the opening of the stop valve in the pipe, and the accompanying forcible hammering. For instance, with one-fifth opening of stop valve the first hammering was noticeable after four minutes; at three-fifths opening, after thirty seconds; and fifteen seconds after the valve was wide open, powerful hammering and violent motion of the pipe set in, in each case accompanied by an impulsive discharge of water and air, and later by steam from the air and drain cocks. These phenomena are due to the fact that the steam is condensed by the water present, and only when the water has attained the temperature of steam does the impulsive action of the latter set in.

The pressures observed on the gauges at the end of each trial (test No. 8) fluctuated between 284·5 and 1,066·75 lbs. At one time the greatest pressure would be observed on the gauge tapped in the flange, and then on the one attached to the side of the pipe.

(B.) *With the Second Experimental Pipe—(a) According to the First Arrangement.*—To establish the action of steam in bent piping of large diameter, the same tests as above were made with the second experimental pipe. Steam from the 3·14 in. supply pipe was admitted into that part of the pipe which was inclined upwards.

In testing the pipes when empty, with or without vacuum, the same observations as before were made. When the pipe was one-third full of water, the action of the steam was entirely different from that observed in the first experimental pipe. Only single blows occurred in the pipe, which was insignificant in comparison with those observed in the first pipe.

The greatest pressure observed in any of these tests—the cocks being open and steam admitted suddenly—was 426·7 lbs. on gauge I., 113·7 lbs. on gauge II., 199 lbs. on gauge III., and 113·7 lbs. on gauge IV. In opening the stop valve slowly, the hammering was so insignificant that the maximum pressure indicated on all the gauges at the end of tests was the same as the boiler pressure. The great difference in the results of these tests and those with the first pipe suggested a modification of this pipe, in which one end was curved upward to an angle of about 30 degrees.

(*b*) *According to the Second Arrangement.*—The same genera results were obtained as with the first experimental pipe forl the eight tests of the programme and with the different openings of the stop valve, the only difference being that the intensity of the hammering in some of the tests caused accidents, which in some instances resulted in breaking the new heavy ropes which were used for holding the pipe. On August 14th, when the stop valve was three-fifths open, the pipe being filled with water, and with the air and drain cocks open, the threads of four nuts on the securing bolts in the end flange were sheared off, the flange itself was much bent, the gauge tapped into it destroyed, and the pipe in the neighbourhood of this flange bulged outwards. The pressure shown by gauge I. was 483·5 lbs., by gauge II. 384 lbs., and by gauge III. 924·5 lbs. On August 22nd, with three-fifths opening of the stop valve, and after the steam had been turned on for 65 secs., the pipe burst 3·9 in. from the end flange for a length of 8·26 in. The pressures in this case were 313 lbs. on gauge I., 185 lbs. on gauge II., 853·3 lbs. on gauge III., while the limit of 2,133 lbs. was exceeded on the gauge in the flange. After this accident the damaged portion of the pipe was cut off, and the repaired pipe used for further tests.

(*c*) *According to Third Arrangement.*—The same observations were made as with the first pipe and the arrangement *b* of the second pipe.

To determine at what water level violent hammering takes place, the height of water was gradually diminished by stages 1·18, 0·78, and 0·39 in., until it reached 6 in. deep at the steam inlet end. At this level motion of the pipe was still observed, but the hammering had nearly ceased, so that it had no effect on the gauges. At a level of 6·69 in. the hammering was still so very violent that the maximum pressures observed on September 25th were: On gauge I., 853·3 lbs.; gauge II., 497·8 lbs.; gauge III., 853·3 lbs.; and on October 3rd, on gauge I., 568·9 lbs.; gauge II., 497·8 lbs.; while the screw tap on gauge III. was torn off.

By increasing the original water level of 9 in. to 9·84 in.—measured at the flange where the steam entered—the two bolts vertically opposite each other in the end flange were broken and the first section of the pipe near the intermediate flange ruptured by two splits, 2·3 and 3·9 in. long. After this the pipe was useless, and no further tests were made. In none of these tests could the water in the pipe be entirely ejected, even after a long period of blowing off and after the pressure had fallen to that in the boiler. In most of the cases the water level was 3·14 in. high, measured at gauge I.

As a result of these tests it is shown that destruction of a completely drained, although entirely cool, pipe cannot occur, whether the stop valve near the boiler under steam is opened gradually or in a sudden, careless manner, because hammering, which alone can cause an explosion, does not follow. But it is to be observed that a rapid filling of the pipes with steam may prove disastrous, for the sudden heating up of the various parts may cause rupture, due to unequal stresses on and resistance of the material.

When, however, a large quantity of water is contained in the pipes and the steam is forced to find its way through it and to carry it along, an explosion may occur, even if the stop valve is opened in the slowest and most careful manner. If there is so little water in the pipe that steam need not force its way through it, no disastrous hammering will occur, nor will the water present be carried along by the steam when the stop valve is opened, as was demonstrated by the amount of water left in the pipe after the end of all tests. The results of the tests with the first arrangement of the second experimental pipe lead to the conclusion that where water has accumulated in U bends of pipes, if the stop valve is opened gradually, the entering steam will distribute itself at once uniformly over the surface of the water, and by virtue of its pressure, in spite of the original condensation, is not only maintained, but steadily increased, and will prevent any agitation of the water and, consequently, hammering. If, however, a sudden change of pressure and a rapid influx of steam occur, then the water will be agitated, and, once in motion, it will cause violent and dangerous hammering in the pipe. Therefore, steam pipes with pockets are to be avoided. The variation of the pressures indicated on the gauges after all the tests leads to the conclusion that the water is thrown backwards and forwards, wave motion like, caused by the influx of steam, and that the pressure is greater or less depending on the intensity with which the moving mass of water strikes the opening to which tha gauge is attached.

APPENDIX B.

List of cases in which enquiries were held by the Board of Trade as to the cause of valve and steam pipe explosions to British vessels, land boilers and connections, also heating apparatus fitted to churches, public buildings and schools.

TABLE I.

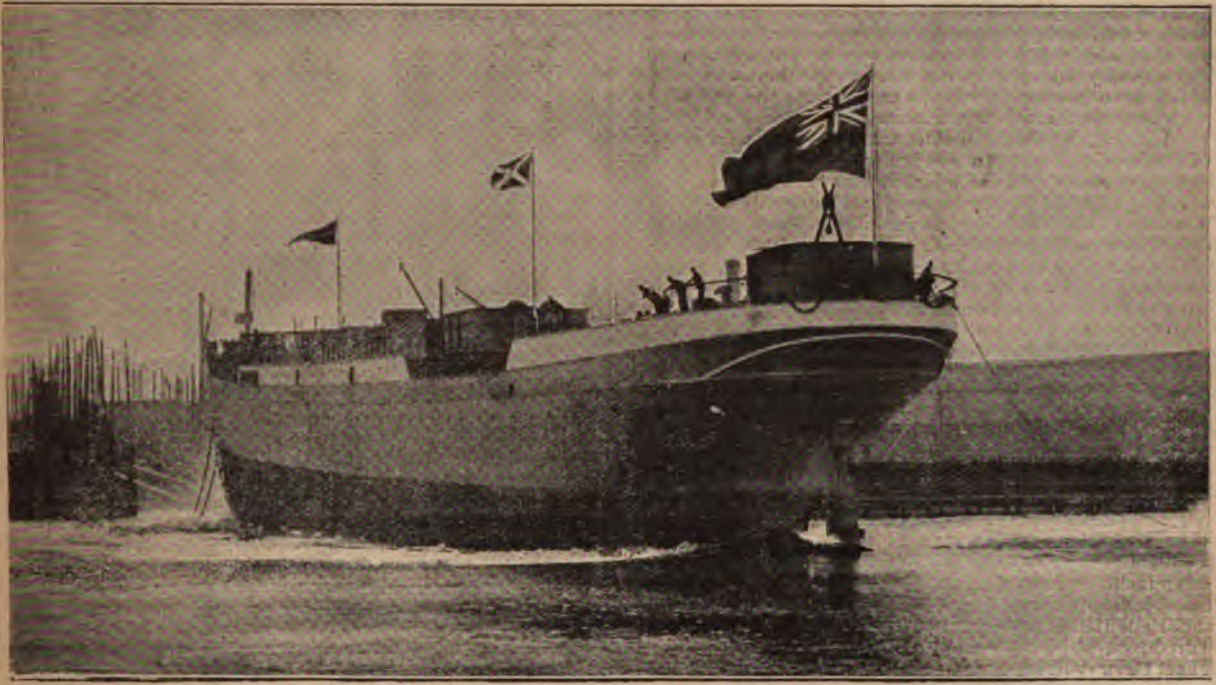
List of cases in which enquiries have been held by the Board of Trade as to the cause of casualties to steam pipes of British vessels:—

Name of Vessel.	Date of Casualty.	Casualty, Cause, &c.
Number Three ...	1891.	The accident was attributed to the presence of water in the pipe.
Rohilla	1891.	Accident attributed to an accumulation of water in the pipe.
City of Lincoln ...	1891.	Accident attributed to the presence of water in the pipe, and to the existence of old flaws in the copper.
Shannon	1892.	Accidentwas attributed to the impact of water in the pipe, set in motion by the admission of steam from an auxiliary boiler.
Grimsby	1892.	Casualty was attributed to water in the pipe being set in motion when the stop valve was opened.
Viola	1862.	Stop valve box (cast-iron) burst. Accident was attributed to the accumulation of water in the steam pipe, the draining arrangements having been allowed to get out of order.
Astrakhan ...	1893.	Winch steam pipe broke, due to water in the pipe being set in motion when steam was turned on.

N.B.—One of the most recent cases was that of the s.s. *Sarpedon*, where the intermediate stop valve chest had burst, having been opened while water was in the pipe.

Summary.

I trust I have now succeeded in showing the great importance of the question with which I have dealt in this paper. I have indicated what I regard as the main defects of the existing system of steam and other valves and my opinions are borne out by the official reports and returns of explosions which I have quoted. As to the remedy, I have ventured to submit for your consideration an invention of my own designed to remove the defects of the old system, and even if I fail to convince you of its merits I have at least raised questions which demand the serious attention of the engineering world. It must not be forgotten also that there is a tendency, especially in connection with marine engineering, to employ what were once considered abnormal pressures, and the interests of life and property alike demand that means of reducing the attendant risk shall receive due attention. The adoption of water-tube boilers is a case in point involving an admitted increase of pressure. Briefly, what I claim is that by the adoption of my valve system the following amongst other advantages may be obtained.



THE "AVONDALE CASTLE" LEAVING THE SLIPS. (*See page* 355.)

1. The substitution of a perfectly balanced spherical valve under all pressures for one on the old principle of lifting, which is liable to get out of order or to cause explosion, consequent on faulty construction and the absence of proper means of draining steam pipes and other connections therewith.
2. The valve can be worked easily and instantaneously and is not affected where dirty or gritty water is used.
3. The valve can be adopted for steam, hydraulic, gas, mining and all other purposes for which valves are in daily use, and made of cast-iron or gun-metal.
4. The valve drains the connections of boilers, &c., of all water created by condensation of steam, thereby preventing dangerous hammering in the pipes and obviating, under certain conditions, the bursting or freezing of pipes and concomitant dangers.

In the discussion which followed the reading of the paper, Sir Frederick Bramwell gave particulars of his experience in connection with the safety valves of H.M.S. *Thunderer*, after the well remembered and disastrous explosion of some years ago. He said that the safety valve was taken off, and fitted to one of the Portsmouth dockyard boilers, but would not blow off until a pressure of 60 lbs. was reached—showing that it had set—but when once it had lifted it would lift again. If, however, it were allowed to get cold, it would again become set. At the Crossness pumping station there was a pipe connecting two boilers, and having a dip in it. At the lowest point there was an automatic drain valve, which, Sir Frederick said, did not act. Steam was raised, and the water ramming met the bend and broke the pipe. The speaker did not see any particular value in the present valve being made spherical in form.

Professor Hele-Shaw said he did not gather from the drawings on the wall that the valve was intended to be used as a safety valve, and he did not understand from the paper that the author proposed using it for that purpose. The diagram showed, however, that it could be pushed off its seat by overcoming the resistance of a spring, and when the water that had to be released had escaped, the sphere would resume its former position. The valve was, therefore, balanced, not by steam, as was usual with equilibrium valves, but by a spring, and this the Professor looked upon as a valuable invention. He questioned, however, whether the design was not an expensive one to carry out. There was a large quantity of gun-metal, and the turning of a sphere was in any case not a cheap operation. In this sphere, however, there were openings in the shape of grids, and any mechanic would recognise how this fact would add to the difficulty of turning.

The author, in reply, said that the sphere was used because of its uniform shape allowing equal expansion and contraction, and would not stick. In regard to cost, the price paid for a cast-iron sphere of 3 ft. 10 in. diameter was £50 a ton. This was for an opening in a bulkhead. There was, however, no trouble in turning up the smaller spheres for steam valves.

The President (Sir Douglas Fox) in thanking the author for his valuable paper, said that having regard to the frequent loss of life, that the introduction of a spherical balanced valve under all pressures was of the greatest importance and it must be borne in mind Mr. Casey had stated a valve on this principle had been at work daily close upon 18 months at 750 lbs. per square inch working pressure and without requiring any repairs.

Messrs. Yarrow & Co., have built four torpedo-boat destroyers for the Argentine Government within 12 months. The consumption of coal in these boats was from 2 lb. to 2½ lbs. per I.H.P. per hour, which bears very favourable comparison with that of destroyers recently built for the British Government.

THE FLEETS OF THE MAIL LINES.

(*From our own Correspondent.*)

Travel to the Cape

By the Castle Line intermediate steamers has been facilitated since the end of October by the fact that now these vessels, as well as the company's mail packets, go along the extension works at Southampton for the embarkation of passengers.

Liverpool,

too, has been catering for the public needs. The great work at the north end of the landing stage has reached practical completion. This will not enable anything to be done which has not been hitherto possible, but it will very much extend the present facilities and prevent the dangers of a possible congestion or delay at busy times. The limits of the present stage appear now to have been reached. For the Pluckington Bank seems to bar extension to the southward, whilst the jetty now completed forbids any further stretch to the northward. This jetty fulfils a double purpose. First of all, it is a solid buffer against possible collision with the floating stage by vessels carried up by the strong Mersey tide, or by heavy weather. That this was a matter to be guarded against was proved by an actual collision some years ago, when the latest addition to the stage had not been made, and when, consequently, the end of the fabric was much further than it is at present from the entrance to the Waterloo Dock. But besides fulfilling this useful purpose it will relieve the stage of the Irish cattle who have hitherto been disembarked there, and will thus make it possible to reserve the landing stage proper for passengers alone. As the jetty is of course a solid erection, built upon piles driven into the river bed, and made strong enough to resist any probable collision it may be called upon to sustain, it cannot, like the stage, rise and fall with the tidal movement. But the object effected by the floating of the stage has been attained in the jetty by the provision of three decks or platforms. Thus, whatever may be the state of the tide, cattle can be landed on one or other of the platforms. A line of rail in conjunction with the main dock lines will traverse the jetty, and upon it will also be placed a couple of hydraulic cranes for the discharging of the cargo carried by these cattle boats. Thus great saving of time for this class of vessel will be obtained, as they will be able to get a berth immediately upon arrival, without waiting till the more purely passenger traffic is disposed of, and the landing of cattle, goods, and passengers can all be effected simultaneously. It will be seen from what I have said that the Dock Board has, since it determined to build the riverside station and give train-to-boat facilities, not only relieved the landing stage of much of its most tedious and troublesome work, but has also made a substantial addition to its length. The amount added is about four hundred feet, which is certainly enough for a berth of the longest channel steamer likely to be seen there, even if it be not equal to that taken away from the channel steamer monopoly by the daily advent of Atlantic liners.

MacAndrew's Hymn.

When Mr. Rudyard Kipling has entered into controversies regarding matters of pure business and of political economy, I have taken occasion in these columns to make adverse criticism of his writings. I have, however, always given him the credit which is his due for his close observation and his study of the technique of matters which are far more in the way of the practical and professional man than of the conventional pale poet. It is, therefore, with unfeigned pleasure that I see the publication of his latest work, "The Seven Seas." It contains the first real poetry I have met on the subject of the marine engineer's profession. I am glad to see that the poetry inherent in the most mighty, yet most delicate machinery of the modern steamer, has appealed to a truly artistic mind at last, and I am glad that Mr. Kipling has had the privilege of being the pioneer in this new region. He will assuredly have many followers. He has seen the character of the rugged men who were perhaps more characteristic of the last generation of marine engineers than of the present. He has observed the fine contempt which such a man has for the saloon passenger—a contempt which the saloon passenger has worked hard to obtain. He knows the Scotch descent and training of the engineer from north of the Tweed, and he works in, with infinite and well-concealed skill, the theological with the practical side of such a man's nature. Let me quote a few lines :—

"From coupler rod to spindle flange I see Thy hand, O God,
Predestination in the stride o' yon connectin' rod,
John Calvin might have forged the same—enorrmous, certain, slow,
Aye, wrought it in the furnace flame, *my* Institutio."

This reference, "enorrmous, certain, slow," may perhaps refer to the slow and majestic movement of the early paddle engine with its long stroke. But he is up to date indeed when he speaks of the electric engine—

"They're all awa'. True beat, full power, the clangin' chorus goes,
Clear to the tunnel where they sit, my purring dynamoes."

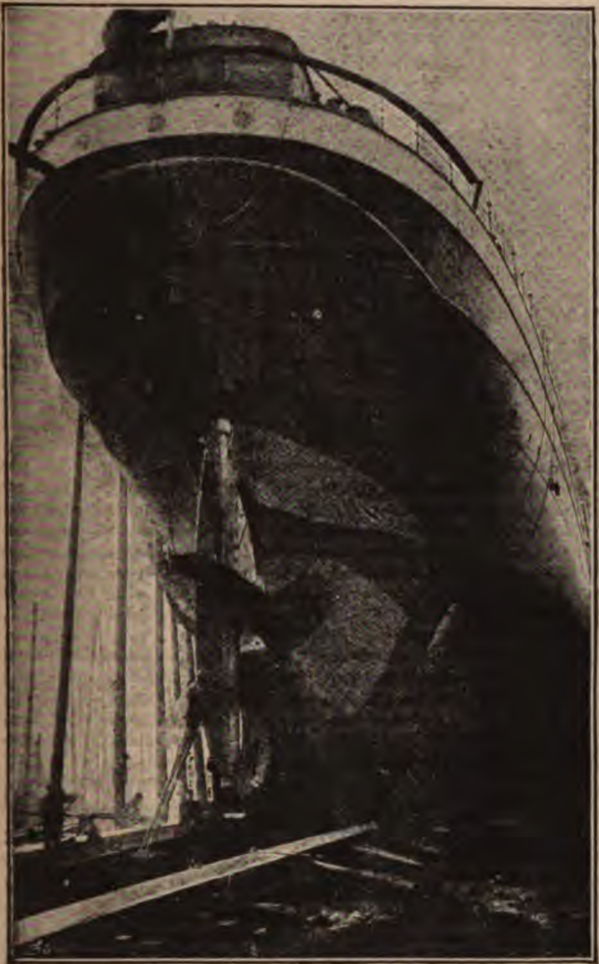
He cries for a Burns to sing the power and might of suggestion of the engine. We credit the modesty of Mr. Kipling, we appreciate the reverence which Mr. MacAndrew would naturally feel for the great poet of the north ; but a more stirring and more thought suggesting poem than Mr. Kipling's I do not wish to read. But my readers must lose no time in studying the poem and making their own reflections upon it. It is a poem of a kind which makes one's blood warm, and makes one appreciate the fascination which the sight of a marine engine excites in the ordinary mind, which feels dumbly after the thoughts to which Mr. Kipling has here given voice and expression. Mr. Ruskin indeed has appreciated the shipbuilder's art, and the wonderful results of his work. He, however, lacks the practical side of Mr. Kipling's character, and Mr. Ruskin's pride in this regard cannot interest the marine engineer as must the poem to which I refer.

Life Insurance and Pensions for Officers.

Sometime ago, when a deck-officer of an Atlantic mail steamer was lost overboard in the execution of his duty, a subscription was raised for the benefit of his bereaved relatives. At that time I deplored the fact that the loss of such a mans' life in the course of his duty should necessitate an appeal to charity for the benefit of those dependent upon him. It is true that the Merchant Navy is in this respect no worse off than was the Royal Navy until recently. For though pensions and gratuities are provided by the State in the case of those officers and men who are killed in action, there is no provision for those who, equally in the course of duty, are lost by perils of the sea. The want in the Royal Navy was partly remedied by private effort a few years ago, when the profits of the Royal Naval Exhibition at Chelsea were applied to the inauguration of a fund for the purpose. But nothing has ever been done for the equally important merchant service. Nor from the nature of the case did it really seem possible that much could be effected in this direction. Mr. Ismay, of the White Star Line, did a great deal for one individual to effect when he gave his princely gift to the home for Aged Mariners at Liverpool. That was for the men. He has now shown how something may be done for the officers, and he has put forward a scheme which will be very beneficial to the navigating and engineering officers of his ships, as well as to the heads of what may be called the commercial and service departments. Briefly, his line has entered into arrangements with the Royal Insurance Company—one of the most highly respected and prosperous offices in the world—whereby at certain rates special to them the officers of this line will be enabled to ensure their lives and to obtain pensions on retirement. The details of the scheme have naturally to be somewhat elaborate to meet the exigencies of a life at sea, and to provide for the possibility of an officer leaving the service either by his own or by his employer's desire. But the principle involved is simple. To obtain the benefits offered by the Royal Insurance Company a premium has to be paid. This premium will be paid by the steamship company on behalf of its officers. One third of the amount thus paid will be a free gift from the company to its employé. The other two-thirds will be paid by the assured officer himself. But it will not be deducted from his pay, but from the annual bonus which the company gives to its servants. In cases where an officer is not employed on bonus terms special arrangements will be made, and where from any cause an officer becomes disentitled to a bonus in any particular year, the company will provide the whole premium for him and deduct the payment thus advanced from the next bonus to which he may become entitled.

It will be seen from what I have said that the officer will pay two-thirds of the premium, and will thus feel that he is paying for his advantages and is not a recipient of charity. But it will also be seen that the incidence of the call upon his resources is made as light as forethought can cause it to be, and that where a man will miss his bonus, he will not be called upon to make up the payment from his pay—which might be inconvenient—but will have the firm's assistance to carry over till the next time he is entitled to one.

Such a scheme as is here presented reflects the greatest credit upon its originator, and I trust will be found beneficial to those for whose advantage it has been devised. If expectation be realised by those who originated it, we may hope to see that other lines and other firms will make similar schemes for the benefit of those who pass their lives at sea. For in spite of all that the shipbuilder and engineer can do, the sea still has its risks to life, and a man will do his duty to his employers none the less efficiently because he knows that if the worst happens he need not apprehend that those dependent on him will be thrown helpless on the world.



THE "AVONDALE CASTLE" BEFORE THE LAUNCH.

An Engineer's Feat.

A very smart and, it is said, unprecedented piece of work was performed by the engineers of the screw steamship *Oakbranch*, owned by the Nautilus Steamship Company. This vessel was only built last year by Messrs. Doxford, of Sunderland, and is of some 3,200 tons gross register. She has triple-expansion engines of some size and power as her low-pressure cylinder is 68 in. diameter, with a stroke of 42 in. In the month of October, 1896, this vessel was on a voyage to Sydney from Yokohama, when her tail shaft broke inside the tube as the vessel was not far south of the equator. The propeller fell off and the ship was, of course, completely disabled. The engineers, however, succeeded in replacing both the shaft and the propeller at sea in eight days, and the vessel resumed her voyage, and nine days later reached Sydney without assistance. The *Oakbranch* was of course fortunate in having the spare gear on board, but she was infinitely more fortunate in having officers with the skill and determination to carry out so difficult and heavy an operation at sea.

Two Launches.

At the beginning of November I had a very pleasant little visit to Glasgow, which extended a very warm welcome in spite of cold and fog. The occasion was the addition of two more vessels to the Castle Mail Packet Company's already extensive and modern fleet. The expansion of South Africa can surely be very fairly gauged by what the Castle Line—so largely identified with its prosperity—has done and is doing to provide facilities for transport between the mother country and her growing child. A fleet of six vessels is needed to provide a fortnightly service to the Cape. Remembering this fact we may notice how modern are the vessels which Sir Donald Currie provides for the public needs. There have been quite recently added to his mail line the three well-known passenger vessels, *Dunnottar Castle*, *Tantallon Castle*, and *Dunvegan Castle*. Now we know that a fourth, 500 ft. in length, is being built at Fairfield, and I hear a whisper that this order is likely to be followed by others. Thus within a year of the present time we may look to see the Castle Mail Line carried on by a practically new fleet. As with the mail service, so with the intermediate. The *Harlech Castle*, the *Arundel Castle*, the *Lismore Castle*, and the *Doune Castle* are all new boats, and they are being joined by the *Tintagel Castle* at the end of November. The *Tintagel's* sister, the *Avondale Castle*—which was one of the two I saw launched—will complete the six needed to carry on the intermediate service. Yet there are two other vessels approaching completion, and it may be asked what can be the object of this construction. These vessels are the *Dunolly Castle* and the *Raglan Castle*, sister ships, and both building by Messrs. Barclay, Curle & Company at Whiteinch. I saw the former launched by Sir Donald Currie's daughter, Mrs. Molteno, at the beginning of November, and the latter is almost ready to take the water. The occasion of the launch of the *Dunolly Castle* was an important one, for she marked the first step in the new development of the Castle Mail Packet Company's policy. She is called—for want of a better name—an intermediate boat, but she is of a different class to the *Avondale Castle*, launched at Fairfield the following day. She has less cabin accommodation, less speed, and much more cargo space. The *Dunolly Castle*, in fact, approximates more to the pure cargo boat than anything the line has yet possessed. No doubt the trade demands the construction of such vessels now, and we shall see the development of a third service of this class of vessel, which is in its way quite as valuable and necessary as the more strong mail and intermediate lines. Every one, as Sir Donald Currie pointed out in his speech at the launch, does not desire speed, and certainly it is not everybody or everything than can afford it. The *Dunolly Castle*, with the comfortable little saloon on the upper deck, will be a pleasant conveyance to the Cape for those who are not pressed for time, and the couple of dozen cabin passengers she can accommodate will have comfortable state-rooms, and make themselves a happy sort of family party. To those who travel by the great mail boats this is impossible. But the few saloon passengers for whom room is found in this vessel are a very minor consideration to her. Her provision is to carry the emigrants whom the development of Africa calls for, and to carry out the machinery and manufactured goods which are needed to aid them in that process. To that end we see that the vessel has a deadweight capacity of some 5,000 tons of cargo, and that a very noticeable feature is the great size of her hatchways, so that she can carry the largest pieces of machinery required at the mines. The large hatchways are unlikely under any circumstances, however, to be a source of danger to her, for the arrangement of hatches and the strength and number of the shifting beams and fore and afters is very remarkable. The wants of the emigrants are not less carefully anticipated. The ship has fine and lofty 'tween decks, which seem especially roomy owing to the great beam. These are fitted with every convenience which experience can suggest for the carriage of passengers. The sanitary appliances are numerous and well designed, and the enclosed berths provided for the third-class passengers are equal to some second-class state-rooms. Like all the vessels now building for the line, the *Dunolly Castle* has triple-expansion engines, and her steering gear and other arrangements are much after the pattern of the mail boat *Dunvegan Castle*, which I recently described.

The *Avondale Castle* needs no long description from me here. She is a fine and comfortable boat, and contains the result of much thought and experience in the adaptation to the wants of travellers. The launch was interesting to me from a detail which may also interest some readers. I had heard that the old mooring chains of the defunct *Great Eastern* had been purchased by the Fairfield Shipbuilding Company, and were used at their launches. To verify this I examined the chains before the launch with some care. The enormous size of the links lent probability to the tale, but their excellent condition seemed incompatible with a life of nearly 40 years. No one seemed to know much about the matter, but before I left the yard I was positively assured that these were indeed the great ship's last remains. By the courtesy of the Editor of *Black and White*, we are enabled to give three views of the launching of the vessels from photographs by Maclure, Macdonald & Co., Glasgow.

Fairfield seemed fairly busy with the *Tintagel Castle* and a second class cruiser for the Royal Navy nearly ready for delivery. Another second class cruiser was just launched. An Isle of Man boat was in frame, and the *Alaska* was getting ready for her Spanish owners up the yard.

Before I leave the subject of the new Castle Liners I may say something about their names, as the nomenclature of the fleet is a matter to which the head of the concern pays great attention. The *Dunolly Castle* is named after a fortress on the west coast of Scotland. The meaning of the word Dunolly is doubtful. Some say it means the Fort of Olave, and others the Fort of Macdougall.

The *Avondale Castle's* name has caused some little discussion. Some have thought it an Irish name, and see in it a reference to the late Mr. Charles Stuart Parnell. They are, of course, wrong, as are those who give it an English origin. The Castle is a Scottish one, and it is situate near Hamilton Palace. It is a place of considerable importance in the history of the Northern Kingdom.

The Southampton Atlantic Steamers

still seem to suffer from minor, but none the less aggravating misfortunes. The Hamburg-American liner *Furst Bismarck* was reported off New York with her starboard shaft broken on Friday, November 6th. She, however, made her dock without assistance, and is said to have done the passage in less than seven days in spite of her mishap, whilst her homeward passage, though not commenced on the 12th as per schedule, was started only two days late—a very smart piece of work.

Then as to the American Line. I last month mentioned the mishap to the *Paris*. Ere she got back to the cloœr, the *New York* developed a defect, which made her remain at Southampton till Monday night, instead of sailing as usual at noon on Saturday.

The P. & O. Company.

Saturday, November 7th, was a very important day in the history of the P. & O. Fleet. It saw the launch of the first twin-screw steamer constructed for their line. This was the *Candia*, a 6,000-ton cargo boat, launched by Messrs. Caird, of Greenock. So the great company of Leadenhall Street has at last followed the ruck, and got what every day is showing us to be the safest class of steamers—that which has duplicated machinery. We may wish the *Candia* good luck, so that she may satisfy the minds of the Board that they have done the wise thing, and induce them to give the mail lines under their flag the same safeguards which are now afforded to passengers on other routes.

"A Thousand Pounds Pressure."

I have received a copy of a pamphlet with the above heading. It is written by a gentleman who does not profess to be an engineer. He has observed that steam pressures have risen from "as nearly nothing as makes no matter" in the case of the very early steamers to what he considers a maximum at the present day of 180 lbs. He has further observed that the increase of pressure has been accompanied by a regular diminution in the consumption of coal, and he therefore tells shipowners and shipbuilders, and marine engineers that they should not use 180 lbs., but 1,000 lbs. No doubt he is theoretically right if he can provide—as he professes to do—a chain with which to control the powerful genius he would have us invoke. But the historical argument is strongly against it, so strongly that I think that alone is a sufficient answer to his suggestion. He will observe that the 5 lbs. pressure of the early vessel grew up to 20 lbs. and 30 lbs., and even higher, till men thought of using these higher pressures expansively. Thus we had the compound engines working first at 60 lbs., and then climbing to 100 lbs. and more. The tri-compound engine has brought us to 180 lbs., and the quadruple—which does not at present find much favour—to some 30 lbs. further. With tri-compound engines steam of higher pressure than this would either have to be reduced before use, or the economy would largely be lost. Higher pressures, then, mean multiple expansion, and the feeling of engineers and shipowners is at present against that. We must move by steps. In the past we have crept up by an addition of 5 lbs. now and 10 lbs. then, and it is absurd to ask us to jump up by a 400 per cent. increase on our maximum at a single stride. Neither men, nor machinery, nor materials are ripe for this, and *Festinate Lente* is a proverb which should be taken to heart by such outside enthusiasts who wish to teach marine engineers, the most progressive of all modern scientists, that they do not understand their business.

Southampton and Queenstown.

There has been another expression of opinion on the part of the Southampton Press which shows how valuable in their case has been the ignorance which enshrouds them. It appears that Queenstown had been grumbling, or at least lamenting, because there had been a falling off in the number of eastward mail bags sent through its port from New York. The Southampton people pointed out that on three occasions during the period under review, the Queenstown mails had been taken on by the steamer to Liverpool because of heavy weather or dense fog. From this fact, of course, there was a moral deduced as to the superior safety and advantage of Southampton. The same moral would be drawn from a statement that the sky was blue, or the sea salt. But in this case the matter is really ludicrous. Queenstown is after all only a port of call; Southampton is the terminus of the line. We constantly hear of vessels having been detained so many hours by fog up Channel or off the Needles. No captain would keep his vessel lying off Queenstown. It is not worth while. If time is to be wasted feeling his way in or going into the inner harbour for smooth water, he is well advised to employ it in feeling or beating his way up Channel. With the phrase "the well-known dangers of the Needles Channel" before us, and with those dangers emphasised as they have been by strandings of a very serious character, Southampton can only plead ignorance as its excuse in its attack on Queenstown. A port of call may be missed, but somehow or another a terminal port must be fetched, even if to do so the way lies round the Wight and through Spithead.

The Nederland American Line

is coming to the front even amongst the modern Continental lines. I mentioned some time ago that it was building a twin-screw steamer of large size to be called the *Rotterdam*. This vessel will soon be at work. They have now ordered another larger and faster vessel from Messrs. Harland & Wolff, whose workmanship they know well by experience, for they have been running in their line several old White Star and British Shipowners' vessels which came from the Queen's Island yard. The new ship is to be a twin-screw of greater size than the Cunarder *Umbria* or the Hamburg-American *Normannia*, though the speed will not be as great as theirs, being more like seventeen knots. She will have great cargo capacity, but will also carry some three hundred and fifty saloon passengers.

Messrs. C. W. Kellock & Co.

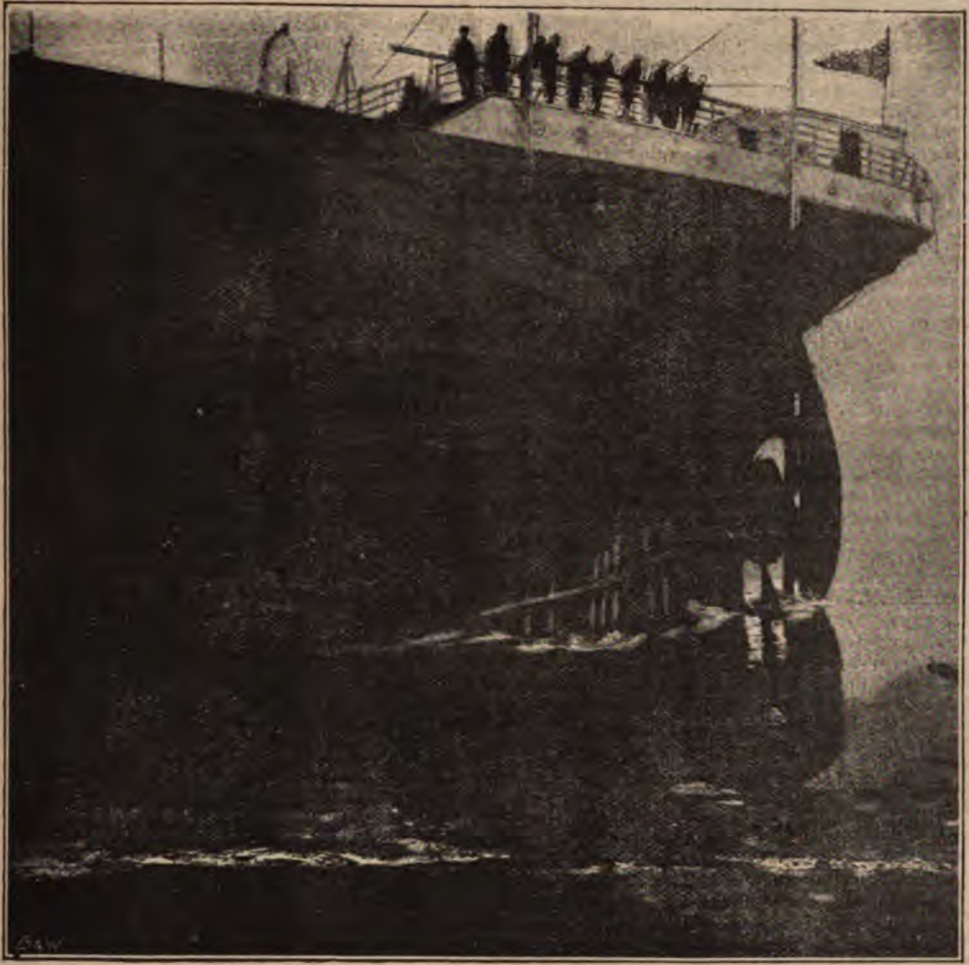
are announced to sell, on the 2nd December, the Spanish steamer which went ashore a few weeks ago at Terschelling. It will be remembered that rather a scare was caused by the announcement of the casualty at the time as the ship was first reported to be a North German Lloyd passenger boat. She was eventually got off and taken to Amsterdam, where she is still lying, and is to be sold in her damaged state.

INSTITUTE OF MARINE ENGINEERS.

BRISTOL CHANNEL CENTRE.

SIXTH ANNUAL DINNER.

FEW more enjoyable and successful social re-unions take place in South Wales and the West of England than that afforded by the annual dinner of the Bristol Channel centre of the Institute of Marine Engineers, the latest of which was held at the Royal Hotel, Cardiff, on Saturday, October 31st., when Prof. A. E. Elliott, D.Sc., presided over a goodly company, including the Deputy-Mayor of Cardiff (Ald. David Jones, J.P.); Mr. John Gunn, J.P. (President of the Cardiff Chamber of Commerce), Captain W. R. Corfield (President of the Cardiff Shipowners' Association), Rev. Canon Thompson, D.D. (Vicar of Cardiff), Mr. James Adamson (Hon. Sec., London), Mr. David Gibson (Vice-President, B.C.C.), Messrs. J. Chellew, R. Davison, Jas. Ferrier, John McCallum, W. Simpson, and A. E. Smithson, members of committee; Mr. David McCallum, representative to Council; Mr. C. L. Ryder, hon. treas.; Mr. George Sloggett, hon. sec.; Mr. T. J. Leaning, district superintendent, Great Western Railway, Mr. J. A. Jenkins, B.A., registrar South Wales University College, Mr. A. K. Hamilton (Lloyd's), Mr. W. R. Hawkins (secretary, Cardiff Chamber of Commerce), Mons. Barbier, Prof. Galloway, Mr. C. A. Heywood, Dr. J. L. Treharne, J.P., Prof. Hughes, M.B.; Mr. E. Handcock, Jun., Mr. Ivor James, Dr. MacCormack, Newport, Mr. Ald. Trounce, J.P., Mr. Huddart, Captain T. H. Sloggett, Mr. J. J. P. Burt, Mr. Chas. Radcliffe, R.N.R., Mr. T. W. Wailes (Denny Gold Medallist, 1895—6), Mr. Albert Evans, R.N.R., Messrs. Ivor J. Williams, D. Dill, and J. T. Harris, Swansea, Mr. A. S. Jackson, Mr. Caswell Henderson, Mr. T. C. Calder, Mr. G. Rutherford, Mr. Sydney F. Walker, Mr. W. Rutherford, Mr. R. J. Field (Messrs. Field&Sloggett, Commercial Dry Dock, Cardiff), Messrs. Bonnyman, Campbell, Dobson, Richards, Marquand, Strutick, Hall, T. James, C. Jones (Bute Graving Dock), Goldsbrough, Boddy, A. Kendrick, W. Kendrick (West Clowes), Bowden, T. Williams, Blackler, J. Williamson (Newport), J. F. Walliker, Mr. W. Aisbitt, and others.



THE "DUNOLLY CASTLE" TAKING THE WATER. (*See page* 355.)

The dinner was admirably served in the banquetting hall of the "Royal Hotel."

After the loyal toasts had been submitted from the chair, and duly honoured,

Mr. John Lockie proposed "The Ports of the Bristol Channel."

Mr. John Gunn, in responding, observed that he was one of those who believed that every port in the Bristol Channel relatively benefited by whatever came into the Channel. The coal exports alone from the Bristol Channel represented about one-half of the exports of the United Kingdom. Of nearly 30 million tons of coal exported from the Kingdom, the Bristol Channel ports were responsible for 14,500,000 tons, by far the largest proportion of which Cardiff contributed. If there was one regret in connection with that marvellous product, Welsh steam coal, it was that those who had invested in its development were not receiving reasonable recompense for their investment. He hoped the day was not far distant when there would be an improvement in this respect, and when everybody engaged in the industry would get a reasonable and fair reward for his labour. He heartily congratulated the President upon the continued prosperity of that centre of the

Institute of Marine Engineers, and also upon the success which marked the Professor's work at the University College of South Wales. He (the speaker), had always recognised the value of technical education. For nearly 20 years he advocated it at meetings of the Associated Chambers of Commerce, urging the absolute necessity of such systematic training if our youths were to be equipped for the battle of life against foreign competition. He cordially wished the Institute a full measure of success. In his opinion, marine engineers were not fairly treated by the Admiralty and other authorities. There were remedies possible, and it rested with societies like theirs to seek to apply them, so that the engineer, whose skill whether afloat or ashore, demanded the highest recognition, should be fairly valued.

The Rev. Canon Thompson, D.D., proposed "Greater Cardiff," and the Deputy-Mayor (Alderman David Jones) acknowledged the toast.

Dr. J. L. Treharne, J.P., proposed "The Institute of Marine Engineers." He said the other day Cardiff received a visit from a society representing the organisers of technical education in different parts of the country, when those gentlemen argued that while we had fallen behind other nations in many trades and professions, in shipbuilding and marine engineering we were a long way to the fore yet. If that was so, and he did not doubt it, it was largely due to the existence of societies like the Institute of Marine Engineers. They were told that the parent society had a young and vigorous offspring in the Bristol Channel centre. He believed that there was another son at Southampton, and they would not be offended with him when, as a medical man, he said he hoped there would be a large increase of family before many years were over. One of the most encouraging signs of the times was that members of the professions should bind themselves together as institutes to discuss matters closely concerning their status and their professional work. This was especially important in the case of marine engineering science, which had gone, and was going, through rapid phases of development, and the problems of which were fraught with questions affecting the lives and the well being of so many persons, and the interests and safety of vast properties. He had pleasure in associating with the toast the name of a distinguished professor so honourably associated with the University College of South Wales and Monmouth, and so able an exponent of engineering science—Professor Elliott.

The President, rising to respond, was very cordially received. At the outset he read a telegram from the Southampton centre conveying best wishes for a successful gathering. It seemed to him, he said, extremely appropriate that a medical man should propose this toast. The two professions were not unakin. The human frame divine had some not distant analogy to the steam engine. It had, for example, a circular current—a circulating pump and valves—of the utmost delicacy and the most complicated mechanism, involving all the mechanical powers we could think of, and possibly some that had not yet been developed. It had a furnace wherein was burnt the carbon which came from food—its fuel—and it burnt that carbon in a furnace with the oxygen of the air, and it respired waste products. The Bristol Channel centre claimed to have done fairly good work during the past year. They had thrown themselves into the great discussion which had overflowed the columns of the technical papers, the ranks of the technical societies, and the premises of the daily press. He referred to the controversy on water-tube boilers. From time to time the Admiralty had been introducing, in manner experimental, water-tube boilers to replace the Scotch marine boiler, and in some circumstances the Admiralty loco-type of boiler. The controversy fairly boiled over when it was announced that the swiftest cruisers ever built were to be boilered each with 48 Belleville boilers. Mr. A. J. Durston, their ex-president, was mainly responsible for that great departure. The Institute of Marine Engineers, as a whole, sided with him in this, and so did the Bristol Channel centre. It was very pleasant to know that one of these cruisers had partly gone through her steam trials, and had shown, almost indisputably, that the belief of Mr. Durston in the Belleville boilers was fully justified. The detractors of the one side, and the advocates on the other, had had their innings. For the most part the innings had been on the side of the detractors. These cruisers were not, they said, to get 18,000 H.P., far less 25,000, which would blow up the boilers. He left them to judge whether the blackest of these prophecies had been fulfilled. During the past year the tendency in marine engineering circles had continued in the direction of increased boiler pressure. It was becoming more and more apparent that if they continued on these lines some change must be made. There were evidences that the water-tube boiler was creeping into the Mercantile Marine, and he was afraid—from the point of view, that is, of the makers of the old Scotch boiler, who had sunk a vast capital in machinery especially designed for that type—that it had come to stay. In at least one case in the merchant marine the pressure had gone up to 250 lbs. with a quadruple engine on five cranks. For years he had advocated quadruple engines on four cranks, and this was a step in advance even of that. He was proud to say that the Institute of Marine Engineers had had something to do with it, and that it was associated in no small degree with a member of the Bristol Channel Centre. In conclusion, the President expressed his gratification at the continued personal interest in the Centre displayed by Mr. Adamson, whose name was also associated with the toast.

Mr. James Adamson conveyed an expression of the regret of the President of the Institute of Marine Engineers at his inability to be present there that evening. He (Mr. Adamson) knew the President would have derived much pleasure from seeing so excellent and representative a gathering. The Council of the Institute also desired him to express their high appreciation of the vitality displayed by the Bristol Channel Centre, as was apparent not only in its transactions but also in the eminently successful character of its annual dinners. If they in London seemed to lag behind they looked to their son, the B.C.C., to stir them up. The B.C.C. had ably backed up the efforts of the parent society in securing a better position, and a better regard for the requirements of the marine engineer. Hitherto they had not succeeded in their endeavours, but he found that in New Zealand an Act had been adopted which covered the whole of the points for which they had been fighting. First, that engineers should be rated upon the articles as officers. Second, that in all cases where there were enquiries by the Board of Trade affecting the engine-room department, an engineer should be upon the Board. Third, that all engineers who went forward for a Board of Trade certificate should have served five years in a workshop. Other points conceded were—that there should be a third-class engineer's certificate, and the substitution of I.H.P. for the 99 N.H.P. It was time to put a stop to this anomaly in this country, but while the Board of Trade had its considering cap on with regard to all these matters they became accomplished facts in New Zealand, or would be accomplished by the beginning of the year 1897. The Council of the Institute had arranged to again approach the Board of Trade, and urge them to cast aside their considering cap, and put on the cap of action. He (the speaker) was present last year when Mr. Wailes received the Denny Gold Medal, and Dr. Elliott had indicated that this year it was possible a similar compliment would be again paid to Cardiff. Unfortunately things had so transpired that the medal had been sent to Hong Kong. Concluding, he had the utmost pleasure in wishing continued activity and usefulness to the Bristol Channel Centre.

Capt. Corfield proposed "the President. Dr. Elliott," whose keen interest in the Institute and the B.C.C. he warmly eulogised, amid the endorsing plaudits of the company. With regard to the observations of Mr. Adamſon, Capt. Corfield pointed out that on the Cardiff Marine Board they had engineers. They certainly ought to be there.

The toast was drunk with musical honours, and Dr. Elliott briefly responded.

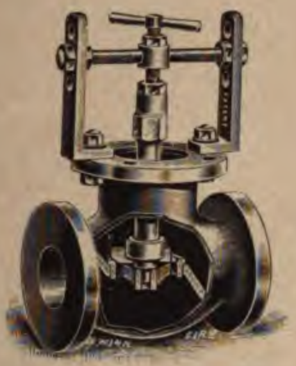
The fourth-class ironclad "Odin," is 72 metres in length, 15½ metres in breadth, and her mean draught, with full equipment, almost 5½ metres; displacement, 3,530 tons; H.,P. 4,800; and her speed at least 15 nautical miles. She is the seventh ship specially destined for the defence of the German coasts and the Emperor William Canal, and conforms, on the whole, to the *Siegfried* type, but differs from the older vessels of the same class in many respects. She has no girdle plating as they have, but is a turret ironclad, with three 24-centimetres guns in two barbette turrets, with plates 20 centimetres thick. She has two screws, with completely separate boilers, and her bunkers can carry 265 tons of coal.

BROOKE'S PATENT VALVE RE-SEATING MACHINE.

THE accompanying illustration of Brooke's Patent Valve Seat re-facer represents a cheap and portable tool designed to supply in the simplest manner a long-felt want in the engine-room of all steamers, where, owing to lack of space or other reasons a scarcity of tools is frequently the case, and where adequate means for efficiently removing the annoyances caused by a badly cut valve seat are but seldom provided.

A glance at the illustration will suffice to show that the necessary pressure is brought to bear on the cutters by means of the vertical feed screw passing through a central eye in the crosshead and bearing on the top of the mandril which carries at its lower end the cutter.

The crosshead is, as will be seen, carried by two legs bolted to the flange of the valve, and the feet of which can be swung inwards for small flanges, or outwards, as shown, for large ones, there being no part which prevents the operator seeing the working of the cutter whichever way the tool is fixed.



The machine, which is actuated by an ordinary spanner, is simple in all its parts, is easily fitted up and adjusted to its work and will stand a considerable amount of rough usage without getting out of order.

Disc steadies are provided for plain bore seats and leg steadies for star ribbed seats, which not only centre the end of the mandril at once, but obviate any tendency to vibration, so that the machine will reface a valve seating true, and leave it without jars or riffles.

The manufacturers, Messrs. Charles Winn & Co., of St. Thomas' Works, Granville Street, Birmingham, send out each machine fitted complete in oak case with five cutters and the necessary guides for dealing with all sizes of valves from 1¼ in. to 4½ in., while, as will be seen from the illustration, when once the machine is set in position it need not be disturbed to change the cutter, as the mandril can be unscrewed from the box nut and taken out, any extra size cutters required being easily made by the engineers, and for extra deep valves, out of the ordinary type, longer mandrils can also be had to order.

Such a tool should form part of the outfit of every engine-room and would doubtless soon pay for itself in the saving of time alone.

BRUSSELS EXHIBITION, 1897.

A MEETING of the British Commission for the Brussels International Exhibition of 1897 was held recently at the London Chamber of Commerce, Sir Albert K. Rollit, LL.D., M.P. (President), in the chair. The Commissioners present included Sir E. H. Carbutt, Bart., Sir Frederick A. Abel, Bart., K.C.B., Sir Hugh Gilzean Reid, Sir Vincent H. B. Kennett-Barrington, M.A., Sir Philip Magnus, Captain Sir Douglas Galton, K.C.B., Major Flood Page, Alderman Treloar, Messrs. H. de Grelle Rogier (Belgian Vice-Consul, London), Edward Verspreeuwen (Belgian Consul, Liverpool), H. L. Hayman (Honorary Consul for Belgium, London), F. H. Lenders (Consul-General for Belgium, London), J. de Lorrain (Belgian Vice-Consul, Dover), W. H. Willans (Deputy Chairman of the Executive Committee), George Wigley, J.P. (President of the Nottingham Chamber of Commerce), Walter Johnson (President of Middlesbrough Chamber), Mark Whitwill, junr. (President, Bristol Chamber), Frederick Eastwood (President, Huddersfield Chamber), Henry Harrison, J.P. (President, Blackburn Chamber), John Gunn (President, Cardiff Chamber), Jonathan Peate (President, Leeds Chamber), W. H. Holland (President, Manchester Chamber), S. B. Boulton, George N. Hooper, A. Serena, J.P., Thomas Tyrer, E. Windsor Richards (President of the Institution of Mechanical Engineers), J. F. S. Gooday (Great Eastern Railway Co.), William Forbes (London, Chatham and Dover Railway Co.), John M. Cook (Thomas Cook & Sons), Arthur Greenwood (Greenwood & Batley), Henry Chapman, M.I.C.E., M.M.M.E., G. S. Mackenzie (Gray, Dawes & Co.), Henry M. Stanley, D.C.L., M.P., J. H. Gretton, L.L.M., M.A., Isidore Spielman, James Dredge (Executive Commissioner), and Kenric B. Murray (Secretary-General). The President, in opening the proceedings, said that the Commission and its various executive and sub-committees might now be considered thoroughly organised, and they had the means of dealing with all points which were likely to arise in connection with the British Section. The prospects of the exhibition as a whole were excellent, and those of the British Section might also be spoken of in almost the same terms. Their progress—thanks to the efforts of the Executive Commissioner—had been considerable, and they might well hope that the result would be creditable both to British industry and the Commission. One disadvantage of their success was that the space they had originally taken—30,000 square feet—was insufficient, but they now had, as a result of negotiation, the opportunity of taking an additional 30,000 ft. at a reduced rate. They had, therefore, to consider the question of means, bearing in mind that there was no prospect of an increase of the grant of £4,000 received from Government. With the additional space they would have the means of making a really creditable display of British goods, and the opinion of the Executive Commission Committee was unanimous that they should not limit their operations, but take the bolder and better course of providing for a wider national representation. The applications already received and arrangements under negotiation would justify their adopting this course, and they had in the absence of adequate national funds initiated a guarantee fund among themselves, which would provide against the unlikely contingency of the whole of the space not being taken up. As regards naval armaments they had the certainty of an excellent exhibit; they were also hopeful of a good display from the carriage and coachmaking industry, and he appealed to the Presidents of Chambers of Commerce in the room for co-operation in their respective districts. As regards the representation of British Art the Executive Committee had been in negotiation with one of the Belgian Commissioners and leading Academicians here with this object, and the Commission was ready to co-operate in any movement initiated by the President of the Royal Academy. Mr. James Dredge (Executive Commissioner) said that the British Section would be located in the best part of the buildings, next to that of France—always an admirable neighbour in any exhibition. He anticipated that the additional space proposed would be fully occupied, and they would close the list of applications for space on the 15th of January. Mr. Peate (President of the Leeds Chamber) stated that the textile manufacturers in his district had combined to make a collective exhibit. Sir H. Gilzean Reid was of opinion that a special effort should be made to secure the presence of Birmingham manufacturers at the exhibition, and after further discussion the Commission unanimously resolved, on the motion of Mr. E. Windsor Richards, seconded by Sir Edward H. Carbutt, to authorise the proposed additional space being taken, and to increase the guarantee fund. Mr. W. H. Holland, as President of the Manchester Chamber, suggested that if a meeting in his town were attended by the Executive Commissioner it would probably lead to a representative Lancashire exhibit, and the suggestion was heartily accepted.

Various other proposals were considered and approved, and the guarantee list having been passed round the table, it was announced by the President, at the conclusion of the meeting, that the total amount guaranteed was nearly £5,000. It transpired that the Executive Commissioner was in communication with the railway companies as to reduced rates for goods and fares for exhibitors and their assistants.

Meetings were subsequently held of the Executive Committee and of the sub-committee for general purposes, finance and juries.

BAXTER'S STEERING GEAR.

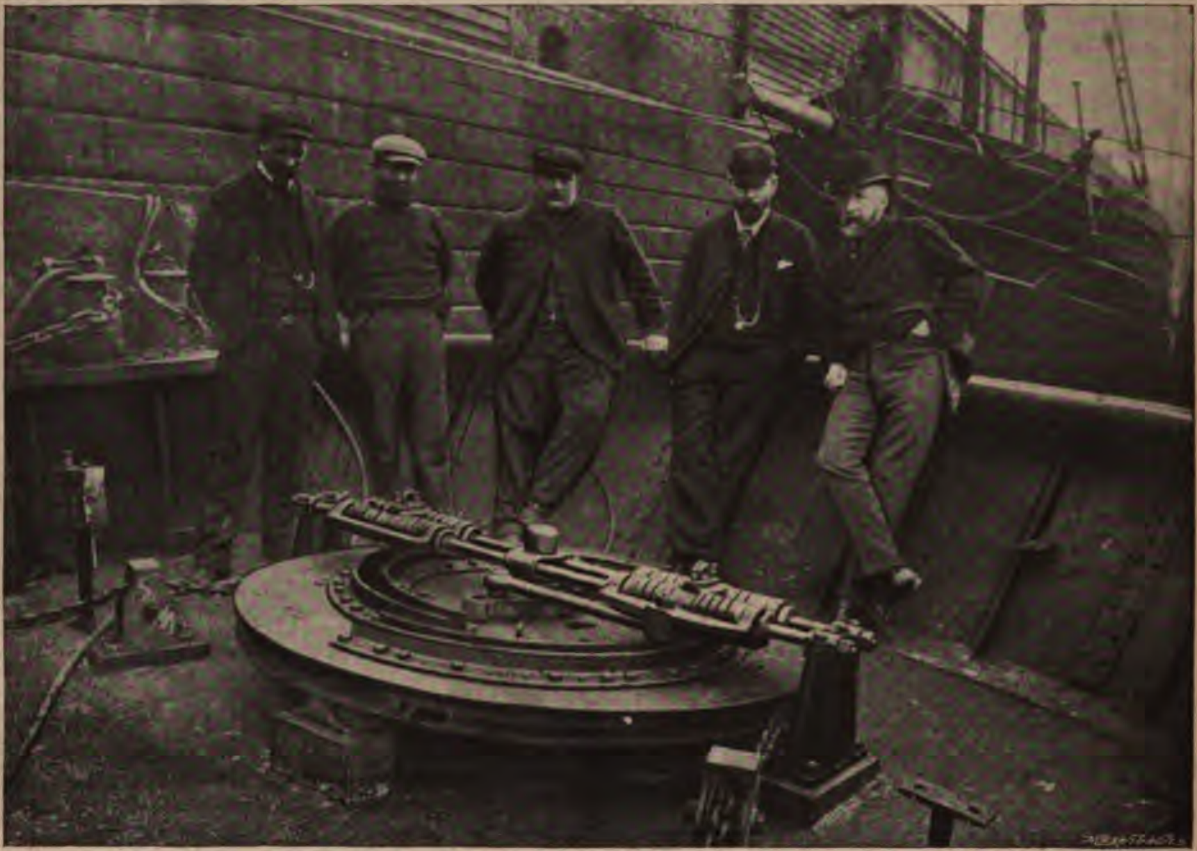
(KERMODE PATENT).

WE herewith illustrate a new steering gear, which merits the attention, we consider, of shipowners and builders. It is the invention of Mr. J. J. Kermode, of Liverpool, and is manufactured by Messrs. Baxters, Limited, the well-known engineer contractors to the Admiralty, of Sandiacre, Nottingham.

The gear consists of a foundation plate, revoluble about the rudder-head, in which are two grooves eccentric to the rudder-head. In these grooves work two gun-metal slide blocks, held by two guide rods, arranged in athwartship position, thereby causing the blocks as the eccentric grooves are revolved to move in or out from the rudder cross-head. Between these blocks and the cross-head are attached connecting rods, but with the important provision of having strong spiral springs interposed between each block and its connecting rod, to take up the greater part of the shocks from seas striking the rudder.

The claims for the gear are—

That it is noiseless, a great desideratum in all vessels. That in every position of the helm the gear is self-locking, thus freeing the toothed driving gear or steering chains from all shocks transmitted by the rudder, these being taken up by the gear itself, primarily by the spiral springs, and finally absorbed by the blocks in the eccentric grooves.



That as the rudder goes over to a greater angle and more power is required, this gear gives such increased power owing to the eccentricity of the grooves. The safety of the gear to the man in charge of it, as no shock or unexpected recoil to the connections can be experienced. Absence of vibration. Change from hand to steam gear can be quickly effected. The longer life of the steam steering engine and gear, owing to the removal of all shocks from coming upon the driving toothed gear.

The circular foundation plate can, of course, be worked as considered most desirable, either as at present by rods and chains from the steering engine, by wire rope instead of chain, or by fitting crown wheel teeth to it, and driving by a pinion direct from the engine. The gear has undergone a practical test in the s.s. *Jackdaw*, of Liverpool, in which it was fitted in March last, and where it has since worked most successfully.

The captain and superintendent of the owners of the vessel spoke so well of it after a thorough trial at sea, that the owners ordered a duplicate set of the gear for the next vessel built for them, the s.s. *Comrade*, and this has just been tried at the mouth of the Humber, the gear standing successfully all tests made, which were as severe as possible. The Naval Commission of the Argentine Republic recently made a trip out to sea in the s.s. *Jackdaw* in order to have practical experience of the working of the gear, after which they were unanimous in deciding to have it fitted to the new cruiser now building for their Government at Birkenhead. Messrs. Laird Bros., the builders, have now placed their instructions with Messrs. Baxters, Limited, for the supply of the complete steering installation for this cruiser.

NEW DOVER AND OSTEND STEAMER.

THE new paddle steamer recently launched at the yard of Messrs. Cockerill, at Hoboken, will complete the fleet of magnificent vessels provided by the Belgian Government for their cross-Channel service between Dover and Ostend. Omitting two reserve vessels, this fleet already includes eight steamers, whose speed ranges from 19 knots to 22 knots, two of them at least being numbered among the fastest paddle boats in the world. The new vessel, which has been named the *Princess Clementine*, is constructed on substantially the same lines as the *Marie Henriette*, which, coming from the same Belgian builders three years ago, attained at her trial trip on the Clyde a speed of 22·2 knots per hour, thus beating the record for paddle steamers. The *Rapide*, which followed last year, was considerably shorter, though little less in beam, than the *Marie Henriette*; but in the *Princess Clementine* a return has been made to the more ample dimensions of the latter, while in point of speed Messrs. Cockerill have guaranteed that the new boat shall accomplish on her trial trip not less than 22½ knots per hour, which will place her in front of all existing paddle steamers in this or any other country. Her exact measurements are :—Total length, 351 ft.; length to the water line, 339 ft. 6 in.; breadth, inside the paddle boxes, 37 ft. 10 in.; breadth, outside the paddle boxes, 77 ft. 7 in.; depth from keel to upper deck, 23 ft. 2 in. Built entirely of steel, the *Princess Clementine* possesses three complete decks, in addition to a large upper navigating deck 23 ft. above the water line. A portion of this deck will in fine weather be open to saloon passengers, who will thus secure the advantage of a second spacious promenade. In her internal fittings and appointments the new steamer will be by far the finest in the fleet of the Belgian Government. Her first-class restaurant, 66 ft. long with seating accommodation for 112 passengers, will be richly decorated in the style of Francis I., and an arcade of pilasters in polished wood will surround the apartment, bearing Limoges ceramic medallions representing prominent personages of that period; while the ladies' boudoir will be handsomely adorned in the appropriate Louis XVI. style. On the lower promenade deck are a suite of luxurious state-rooms, twelve private cabins decorated with water-colour panels, and a snug smoking-room, to be embellished with pictures by well-known artists. Careful attention has been paid to ventilation, and in cold weather the comfort of passengers will be maintained by the heating of the whole of the saloons and private cabins on the hot-air principle. The engines will develop 8,500 H.P. steam being furnished by eight Serve tubular boilers. Sixteen auxiliary motors will complete the machinery, one being attached to a dynamo, which will supply electric light throughout the steamer. Messrs. Cockerill have undertaken to deliver the *Princess Clementine* early in the spring of next year, and it is arranged by the Government that the trial trips shall be made on the Clyde.

NAVAL MATTERS—PAST AND PROSPECTIVE

(*From our own Correspondents at home and abroad.*)

THE First Lord of the Admiralty returned thanks for the Navy at the Lord Mayor's banquet on November 9th, and his little speech was perhaps the happiest effort of the occasion. Mr. Goschen did not forget the Engineers this time, nor the Marines, but appropriately reminded his audience that the effectiveness of the Navy must mainly depend on the efficiency of every branch of its *personnel*. In acknowledging the cordial manner in which the toast of the Navy had been responded to, he said :—"You have toasted the officers of all ranks, from the admiral in command, bound to be sailor, strategist, administrator, all in one, and diplomatist into the bargain, down to the young midshipman fresh from the *Britannia*, who with boyish confidence and a great air of authority takes command of a boat's crew of bearded men—early foretaste of the responsibilities to come; and you have toasted the warrant officers, the very marrow of the Service, and the bluejackets, pets of the people wherever they show themselves, not less daring and handy now when they have to master the mysteries of the torpedo and the monster gun than they were when they had to thread the maze of ropes and spars which baffle the landsman's understanding. When you wish success to all who sail in Her Majesty's ships you do not forget that splendid force, the Marines, always to the fore when hard knocks are expected; men who march with the perfect precision of soldiers on shore, and command equally the movements of their legs at sea. Side by side with the sailors they take their place at the ship's guns. And you will also have remembered the engine-room staff, from the engineer-in-chief, who rules the fiery regions where the pulses of the ship throb with a 25,000 H.P. down to the stokers, who, in the torpedo-destroyers, the newest product of shipbuilding genius, working up to a speed of 30 knots, ply their blazing business with a skill which elevates it almost to a fine art." To these men who handle our modern fleets and ships, said Mr. Goschen, the nation may with confidence commit the traditions of the past.

The Navy and Lord Wolseley.

In striking contrast to the good taste and appropriateness of the First Lord's speech were the tone and matter of that delivered by the Commander-in-chief of the Home Army, in replying for the sister service. Lord Wolseley, it is said, owes his life to the care and attention of a naval officer who, when he was prostrated by the climate in Burmah, took him to sea and nursed him back to health. He owes, too, not a few of his honours and rewards to the work well done by seamen and Marines, as when in the Ashantee and Egyptian campaigns he reaped the benefit of the previous labours and hearty co-operation of the Navy. It is odd, therefore, that he should be so morbidly jealous of naval officers and the naval service. Yet so long ago as when he published the first edition of the *Soldier's Pocket Book* he gave evidence of the existence of this feeling, and on many occasions since he has spoken words which tend to create discord between the land and sea services. This is perhaps characteristic of Lord Wolseley, for it has been said that it was jealousy of his own brothers in arms that caused him to tell the Irish soldiers that Englishmen did not know how to lead them, and to wound our Indian troops by insinuating that they were not fit to meet a European army. It is only right, however, that the words used by Lord Wolseley at the Mansion House should be quoted, as it will be long before they are forgotten. He said, "I would say that the English people, who have recently taken so much interest in the Navy, who have turned their attention to the Navy to such great purpose, should also lend to the Army a little of the sympathy which they bestow so willingly and so justly upon the sister service. I should be sorry to draw any invidious distinctions between these two great services because I think that the history of England contains enough honour and glory for both of them; but I would wish without being at all invidious to recall to your minds and your remembrance the fact that there has not been a naval battle fought for the last 69 years by the English Navy, and yet during those 69 years—a long term of years—very few have passed indeed when during some portion of the year Her Majesty's Army has not been engaged in some part or other of that great Empire of which we are all so proud."

The Record of Sixty-nine Years.

It will be noticed that the words used by Lord Wolseley are that "there has not been a *naval* battle fought for the last 69 years by the English Navy," but in spite of his protest about "invidious comparisons" the context implies that as the Navy has been of no great value for the last 69 years, while the Army has, it is improper to bestow national sympathy on a comparatively undeserving object. Now, in the first place, the nation never has had any lack of sympathy with the Army, and has bestowed freely honours and rewards for all its manifold and gallant achievements; but the War Office, of which Lord Wolseley is the mouthpiece, is notoriously an Augean stable. His Lordship wants more money from the taxpayers for the insatiable maw of the War Office, and he is apparently envious of the way in which to make up for many years of cheeseparing the nation has recently augmented the Navy Estimates. But it should not be forgotten that the Army, which after all is only of secondary consequence in our measures of defence, has never been stinted for money, and the average Army Estimates voted for the last half century are far above those for the Navy. Moreover, it is common knowledge that while we get a pound's worth for every pound entrusted to the Admiralty, and have now a Navy second to none, more money is wasted by the War Office than by any other department of State, and the Army is still notoriously inefficient. It is not surprising, therefore, that the country should close its purse-strings to Lord Wolseley, and reply that they will not be loosed until it can be demonstrated that a better return is to be made for the amount already advanced. As to the work of the Navy during the last 69 years, it is only necessary in answer to his Lordship's taunt to say as the *Times* did on November 14th, that "it is scarcely generous to forget that in the most critical of these campaigns, in the Crimea, in India, in China, and under Lord Wolseley himself, in Egypt, naval brigades have done most brilliant and effective work, while the very fact that the Navy has not been called upon to fight is a proof that it has succeeded in discharging its main function by maintaining British supremacy on the seas."

Portsmouth Dockyard.

Several ships have been placed in commission at this yard recently, but without making any apparent diminution in the number of the fleet and dockyard reserves. The *Prince George*, which is to be temporarily attached to the Channel, received the crew of the *Royal Oak*, but everything points to this latter ship being recommissioned shortly. The *Beagle* sloop has hoisted the pennant of Commander Gamble, late of the Intelligence Department, while the *Indefatigable* will relieve the *Mohawk* in the West Indies. The *Beagle* goes to the south-east coast of America. The *Cæsar* is making good progress and there is a good prospect of this being continued. The ways of the Admiralty are, however, inscrutable, and it will be remembered that the *Eclipse*, although launched in very quick time, in order that the *Prince George* might be laid down in the slip she occupied, was then allowed to languish for months and has now only been completed after the battleship. The *Revenge* has been recommissioned here and gone to the Mediterranean, so that the number of battleships at the yard remains the same. On December 8th the *Gladiator* will be launched, and she will be succeeded by the *Canopus*, which is to be completed in twenty months. The *Mars* is not expected to arrive here until February next, but she will probably be the next battleship to be completed at this yard. A number of the torpedo-boat destroyers are in hand, for these little craft don't go long before they require attention; but it is noteworthy that the longer they are running the less repair do they need. The Fleet Reserve now consists, the "A" division of:—Battleships, *Hercules* and *Sultan*; cruisers, *Iphigenia*, *Latona* and *Naiad*; small craft, *Rattlesnake*, *Charger* and *Havock*, with ten torpedo boats. The "B" division of:—Battleships, *Neptune*, *Achilles*, *Iron Duke*, *Minataur*, *Invincible*, *Swiftsure* and *Glatton*; cruisers, *Mercury*, *Iris*, *Royal Arthur* and *Hecla*; small craft, *Surly* and *Hunter*, with four torpedo-boats.

The Fleets of the Sea Powers.

On November 2nd a return was published as a Parliamentary paper showing the fleets of Great Britain, France, Russia, Germany, Italy, and the United States of America, whether built or building, with date of launch, displacement, and armament reduced to one common scale. Vessels which appeared on June 2nd, 1896, in the official list of each Navy as built or building are enumerated, including under the latter head those for which on that date money had been appropriated and which were shortly to be laid down. Great Britain has 45 battleships, 18 armoured cruisers, 87 protected cruisers, 16 unprotected cruisers, 15 coast-defence vessels, 3 special vessels, 35 torpedo vessels, 42 torpedo-boat destroyers, and 3 first-class torpedo boats, all built; and 12 battleships, 29 protected cruisers, and 48 torpedo-boat destroyers building. France has 29 battleships, 9 armoured cruisers, 23 protected cruisers, 20 unprotected cruisers, 14 coast-defence vessels (armoured), 1 special vessel, 13 torpedo vessels, and 4 torpedo-boats, all built; and 6 battleships, 1 armoured cruiser, 14 protected cruisers, 3 torpedo vessels, and 2 torpedo-boats building. Russia has 10 battleships, 9 armoured cruisers, 2 protected cruisers, 3 unprotected cruisers, 12 armoured coast-defence vessels, 4 special vessels, 16 torpedo vessels, 2 torpedo-boat destroyers, and 3 torpedo-boats, all built; and 8 battleships, 2 armoured cruisers, 3 protected cruisers, 4 armoured coast-defence vessels, 1 special vessel, 1 torpedo vessel, and 1 torpedo boat building. Germany has 21 battleships, 7 protected cruisers, 22 unprotected cruisers, 11 coast-defence vessels, 1 special vessel, 5 torpedo vessels, and 4 torpedo-boats, all built; and 3 battleships, 1 armoured cruiser, 6 protected cruisers, and 2 torpedo-boats building. Italy has 13 battleships, 1 armoured cruiser, 15 protected cruisers, 1 unprotected cruiser, 2 special vessels, 15 torpedo vessels, and 3 torpedo-boats, all built; and 2 battleships, 5 armoured cruisers, 1 protected cruiser, 3 torpedo vessels, 1 torpedo-boat destroyer, and 1 torpedo-boat building. The United States has 5 battleships, 2 armoured cruisers, 13 protected cruisers, 10 unprotected cruisers, 19 armoured coast-defence vessels, 2 torpedo vessels, and 2 torpedo boats, all built; and 4 battleships, and 2 torpedo boats building.

Comparative Sea Power.

The above return is somewhat misleading, since it omits to give details on several important points, nevertheless, it should be reassuring since it shows that our present position is good, and likely to improve if the policy of recent administrations and the present Board of Admiralty is consistently carried out. The issue of the return has, however, been the cause of some discussion, and has discovered to us three separate and distinct parties interested in naval efficiency. On the one hand there is the "Increased Armaments Protest Committee," which while it does not argue on the lines of the Peace Society, contends that as we are now in a position of superiority we may hold our hands, and for the rest trust in moral suasion. Diametrically opposed to those who hold these views are the so-called alarmists, who insist that the return gives support to their contention of our relative weakness, and urge the Government, therefore, to build more battleships. This is the party which, if it has not the direct countenance of the Navy League, has at least the active support of several of its most prominent members. Midway between these extremes of heat and cold there is a third party, which appears to more thoroughly reflect the opinions and views of the naval experts, and possibly of the nation generally. The attitude of this party is one of watchfulness. They say neither that we are strong enough, nor that we are in a position of obvious danger, but that while thoroughly appreciating the forces which make for a slackening of the efforts to maintain a standard of security, they see at present no sign that these forces are exerting undue influence in this direction. If they should discover indications of a relapse towards apathy, or a falling off in effort, they are ready to throw their weight on the side of the alarmists, for then there would really be cause for alarm. This party points out also that something more than mere strength in battleships is necessary to sea power, and all that this phase means. The personal element must not be forgotten, and the training at sea of our seamen and stokers and marines be carried out or efficiency will diminish. Our quantitative strength is even now sufficient to make it very risky to attack us, and other nations are not likely to do so, merely in the hope of injuring us without prospect of advantage to themselves. What we need then is, while maintaining a measured policy of steady expansion, to improve the Navy qualitatively by practice at sea, seeing that history teaches us that quality rather than quantity wins,

The Particular Service Squadron.

This squadron, which it will be remembered was specially commissioned early in the year, has now been definitely broken up. Rear-Admiral Dale having returned home in the *Revenge* has struck his flag, and the late flagship of the Particular Service Squadron has just conveyed the new Commander-in-Chief of the Mediterranean to Malta, and will now become the flagship of Rear-Admiral Harris, the second in command on that station. Rear-Admiral Harris will shift his flag into the *Revenge* from the *Trafalgar*, and that vessel will become one of the squadron under command of Captain Grenfell who took the *Revenge* out. Both the Commander-in-Chief and the Rear-Admiral will now have their flags flying in similar ships, while an additional battleship strengthens the squadron. The *Royal Oak*, the second battleship of the Particular Service Squadron, has also paid off, and her crew have turned over to the *Prince George*, one of the latest vessels to be completed. Of the two first-class cruisers in the Particular Service Squadron, the *Theseus* remains on the Mediterranean station as an additional ship, while the *Gibraltar* has been temporarily attached to the Cape station, and is now at Zanzibar. The remaining cruisers which are of the second-class, the *Charybdis* and *Hermione*, have now been attached to the Channel Squadron. It is probable that the *Prince George* and *Victorious* battleships will be added to this squadron in place of two vessels of the *Royal Sovereign* type, and that these latter will go to the Mediterranean to relieve low free-board vessels. It is known that this is the intention of the Admiralty, and that as the *Majestic* class goes into the Channel the *Royal Sovereign* will go to the Mediterranean, and the ships of the *Admiral* type will become part of the Coastguard Squadron.

Trials of the "Majestic."

The *Majestic* recently carried out a series of progressive trials with the following results:—First Series: Revolutions, 24·46, starboard, and 24·57 port; gross total I.H.P., 223·04; speed, 4·108 knots. Revolutions, 61·07 starboard, 59·72 port; I.H.P., 2,224·27; speed, 10·357 knots. Revolutions, 78·66 starboard, 75·59 port; I.H.P., 4,116·20; speed, 12·547 knots. Revolutions 87·03 starboard, 84·58 port; I.H.P., 7,010·48; speed, 14·305 knots. Revolutions (full power natural draught), 98·52 starboard, 97·83 port; I.H.P., 10,082·9; speed, 16·096 knots. The vessel then carried out three runs with forced draught on the measured distance of 23 miles between Rame Head and Dedman Point, on the Cornish Coast. The following are the results:—First run: Air pressure in stokeholds, 1 in.; vacuum, 26·3 in. starboard and port; revolutions, 103·3 starboard, 102 port; total I.H.P., 11,814; speed, 16·86 knots. Second run: air pressure in stokeholds 1·08 in.; vacuum, 26·5 in. starboard, 26·3 in. port; revolutions, 102·5 starboard, 102·4 port; total I.H.P., 11,914; speed, 16·9 knots. Third run: air pressure in stokeholds, 1·17 in.; vacuum, 26·5 in. starboard, 26·6 in. port; revolutions, 103·6 starboard, 103·2 port; total I.H.P., 11·673; speed, 16·8 knots. Mean of the three runs: air pressure in the stokeholds, 1·08 in.; vacuum, 26·4 in. starboard and port; revolutions, 103·1 starboard, 102·8 port; total I.H.P., 11,800; speed, 16·85 knots. The speed of the ship was in a slight measure retarded by a heavy sea and strong wind, and it is noteworthy that in the circumstances of the trial the forced draught gave an increase of speed of little more than three-quarters of a knot.

Devonport and Keyham Yards.

On December 3rd the *Furious* will be launched at Devonport, and then there will be absolutely no ship on a building slip at the western establishment. Next year, therefore, ought to see several vessels allotted to these yards. In February next, however, the new battleship *Ocean* will be laid down, probably on the 18th, and this vessel will engage considerable, but it is to be hoped not undivided attention. The *Hussar* will be commissioned here on December 3rd to relieve the *Gleaner* in the Mediterranean, and then, so far as is known, the *Renown* will leave the yard probably in April next. The *Magicienne*, however, is to be got ready for another commission, and she may leave first if the defects are not large. The future of Devonport as a naval arsenal, as well as a shipbuilding and repairing establishment, never, says a recent writer, looked more promising than now. The Admiralty commenced some few years ago to recognise the importance of Devonport, and the room that exists for developing the waterway and the foreshore of the Hamoax, and they have not done so in vain if one may judge by what has been taken in hand and what is contemplated in the near future. The principal prospective improvement has reference to providing accommodation for the largely augmented Fleet Reserve which Devonport will soon be able to boast of. It is nevertheless exceedingly likely that space will not be found at Devonport for the new torpedo-boat destroyers, but that here as well as elsewhere round the coast shelter will be found at some of the smaller harbours for these craft. The following are the ships, &c., in the Fleet Reserve. "A" Division:—Battleships, *Northumberland*, *Agamemnon*, *Bellerophon*, *Temeraire*, *Belleisle* and *Gorgon*; cruiser, *Thames*. "B" Division: — Battleship, *Triumph*; cruisers, *Pearl*, *Hyacinth*, *Shannon*, *Sirius*, *Forth*, *Edgar* and *Phaeton*; small-craft, *Phœnix*, *Algerine*, *Speedwell*, *Antelope*, *Harrier*, *Hazard*, *Hussar*, *Rocket* and *Shark*, with six torpedo-boats.

Contracts for New First-Class Cruisers.

The contracts for the three first-class cruisers authorised to be built in private establishments under the current naval programme have been given out. These vessels are sister ships to the *Spartiate*, which is to be constructed at Pembroke Dockyard. All four vessels bear names associated with the old navy. Their length, between perpendiculars, will be 435 ft.; extreme beam, 69 ft.; moulded depth, 39 ft. 6 in.; and displacement in sea-going trim, 11,000 tons, on a mean draught of water of 25 ft. 6 in. They are to be built of steel throughout, on the cellular double-bottom principle, with bronze stem and stern posts. The hulls, externally, will be covered with teak sheathing. In each vessel the engines will be similar, and although the diameters of the cylinders are to be the same as those of the *Andromeda*, the power to be developed is greater by 1,500 H.P. This is consequent upon the greater piston speed at which the engines are designed to run. The four-crank triple-expansion type has been selected, the diameter of the high-pressure cylinder being 34 in., the intermediate 55½ in. in diameter, and the low-pressure cylinders being each of 64 in. diameter, with a common stroke of 4 in. At full power the maximum revolutions will be 120 a minute, the resulting H.P., with a boiler pressure of 300 lbs. to the 19 in., being 18,000, which it is estimated will give a speed of 20¾ knots. Steam will be supplied from 30 Belleville boilers, having an aggregate heating surface of 107,850 square feet, the corresponding grate area being 1·390 square feet. The total weight of machinery and boilers is fixed at 1,525 tons, or rather more than a fourth of the total displacement of the ship. All the propelling machinery will be situated beneath the protective steel deck, which varies in thickness from 4 in. on the slopes to 2½ in. on the crown, and extends from stem to stern of the ship. The armament includes sixteen 6 in. quick-firers, twelve 12-pounder quick-firers, three 3-pounder quick-firers, and eight Maxim machine guns. There are three torpedo tubes, of which two are below water. The *Argonaut* will be built by the Fairfield Shipbuilding and Engineering Co., Govan; the *Amphitrite* by the Naval Construction and Armaments Co., at Barrow, while the *Ariadne* is to be constructed at Clydebank by the firm of Messrs. J. & G. Thomson.

Chatham Dockyard.

It is probable that the following will be found to be a fairly accurate forecast of the principal work to be done in the yard next year. The *Illustrious* battleship and *Vindictive* cruiser, under construction, will be completed, and so also should the battleship which is expected from the Clyde. The *Minerva* cruiser may be considered to be complete already. Then the *Diana* and *Venus*, second-class cruisers, will be finished, possibly before the end of the year, and the *Dido*, a sister ship, if her trials are also successful, will follow them. The *Goliath* battleship will be laid down on the slip from which the *Victorious* was launched, and she is to be completed in from 20 to 24 months. This vessel will hardly be commenced before Christmas, but a great quantity of material to be worked into her is already at hand. A new cruiser of the *Vindictive* type modified, a larger longer vessel, more powerfully armed, and with greater coal-carrying capacity and speed, is also to be laid down in this yard, and will be fitted with Belleville boilers. This is about all in the way of new construction unless there is a delivery here of one of the *Europa* class of cruisers, which is not unlikely, as the *Diadem* is already in the water. Then there are also the destroyers, of which we expect several. In the repairing line there is the *Audacious* and the *Leander* to have thorough refits and partial re-armament. These vessels will occupy the labour of a good many hands. New engines are being made for the *Leander* and new boilers, and on the *Dreadnought*, which latter vessel is also coming to Chatham for a refit. In the Reserve here are:—Battleships: *Audacious*, *Monarch*, and *Superb*;

cruisers *Arethusa*, *Brilliant*, *Leander*, *Sappho*, *Severn*, *Thetis*, *Terpsichore*, and *Tribune*; small craft, *Alarm*, *Alert*, *Chasseur*, *Jaseur*, *Grasshopper*, *Porcupine*, and *Torch*, with seven torpedo boats.

Liquid Fuel for the Navy.

After many rumours to that effect it appears that the naval authorities in this country have at last made up their minds to experiment with liquid fuel. The experiments are only to be on a small scale, the two after boilers of the *Surly*, torpedo-boat destroyer, being fitted for the consumption of oil fuel on the system invented by Mr. Holden, superintending engineer of the Great Eastern Railway. Whether the result is favourable or not, it is unlikely that the Admiralty will be persuaded to adopt this method of producing steam to any large extent. It is bad enough to be entirely dependent for our food to foreign producers, but if petroleum or other oils were generally introduced as fuel for our ships of war it would practically mean that Russia and the United States would have it in their power to cut off supplies and cripple our defence at the outset. There are said to be difficulties of storage and risks of explosion; these, however, appear to have been surmounted abroad, and it is probable that they have been exaggerated. But with an almost inexhaustible supply of excellent steaming coal at home and in our colonies, it would be something the reverse of common sense to substitute another kind of fuel which, if not so expensive in peace time, would at least be more difficult to obtain in time of war.

Sheerness Dockyard.

This establishment continues to grow in importance ever since the naval depôt was sent to Chatham and a gunnery and torpedo school established here in its place. Indeed, the school has outgrown the limits of the old barracks and a new block of buildings is to be added to it, or rather, built on the adjoining recreation ground. These new barracks are to accommodate 80 officers and a 1,000 men. Work is concentrated here on the *Pelorus* and the *Proserpine*. The former is completing, the latter will take the water on December 5th. Other work in hand includes the refit of the *Swallow*, an examination of the *Wye*, and making good defects in the *Circe*, *Haughty*, *Contest*, *Venus* and *Snapper*. The *Dolphin*, having returned home from the Mediterranean, paid off here and will be overhauled later on. We were glad to get the *Pelorus* back again, almost as glad as to learn that her trials had been in every way satisfactory. The *Swallow* will undergo an extensive refit. The *Egeria* will join the Medway Fleet reserve on January 1st, and the *Sanspariel* is having some electric light fittings renewed.

The New French Programme.

The French shipbuilding programme of 1897 has now been settled, although it does not please all the reformers in that country, and notably the adherents of the *Jeune Ecole*. The most important vessel to be undertaken is a battleship of the *Henri Quatre* type. This vessel displaces 8,948 tons, carries two guns of 10·7 in., seven 5·5 in., and twelve 1·8 in. quick-firers. She will have engines of 11,000 H.P., calculated to give her a speed of 17 knots. Her two torpedo tubes will be submerged. This new battleship will, for the present, be known as "A 3." A cruiser, named "C 3," a sister of the *Jeanne d'Arc*, displacing 11,270 tons, and intended for a speed of 23 knots, her engines being of 28,500 H.P., and driving three screws. She will be built at Toulon. A first-class station cruiser, "D 2," is to be laid down at Lorient. She will displace 5,500 tons, and, with engines of 17,100 H.P., is to steam at 23 knots. She will carry eight 6·3 in. and twelve 1·4 in. quick-firers. Another vessel of the same class, "D 3," is to be laid down in a private yard. To a private shipbuilding firm will also be confided a third-class station cruiser, "K 2," which has often been referred to by the name of *Infernet*. She will be a sister of the *d'Estrees* which is in hand at Rochefort. The remaining vessels are a gunboat of the *Surprise* type, "T 1," a 26-knot torpedo gun vessel, "M 2," and six torpedo boats, numbered "P 31" to "P 36." M. de Kerjegn, who is the Parliamentary reporter upon the Naval Estimates this year, is of opinion that the state of the French Navy will not warrant any reduction in expenditure. The credits have been reduced since 1890, both for construction and for armament. He contends that the result has been that France has been unable to lay down more than four vessels of above 2,000 tons in the present year, and she can only undertake three in 1897. This being so, he says it is impossible to complete in sufficient time the ships necessary to replace those which are growing antiquated. He advocates the construction of the Canal des Deux Mers, to connect the Bay of Biscay with the Gulf of Lyons, and other matters which he regards as making for efficiency in the French Navy.

Naval Movements.

There are many signs in Russia of increased activity in naval affairs. Two new battleships of 12,674 tons, the *Oslabya* and *Peresviet*, which are now being built at St. Petersburg, are to be ready for launching next spring, and the two cruisers *Pallada* and *Diana*, which are also in hand, are to take the water in November and be completed by May, 1898. Each of them will cost 2,336,000 roubles. Several vessels are also completing their trials in the Baltic. An attempt made to get afloat the cruiser *Rossia*, which has been lying on a sandbank in the Neva since May was successful, but the cruiser, not being fully under control, ran upon another bank in Cronstadt roads, and it is now certain that she cannot be floated before the navigation is closed. It is proposed to build a dock round her as she lies by driving in a double line of piles, and filling the aperture with concrete. She must now remain where she is until the ice breaks up. The *Sissoi Veliky* and the *Admiral Seniavin* are about to be sent to the Mediterranean, their trials having been satisfactory. The New Alexandra dry dock has been opened, and the *Peter Veliky* was floated in. Torpedo-boat No. 133, which was of the *Pernov* type, has recently attained a maximum speed of 22·72 knots with forced draught. The ships flying the Russian flag in the Mediterranean are shortly expected to visit Naples, when special *fetes* will be organised. In the Pacific, Rear-Admiral Reunoff has been appointed junior flag officer. As a captain he formerly commanded ships both in the Baltic and Black Seas.

Pembroke Dockyard.

The workmen from Messrs. Hawthorn, Leslie & Co., who have the contract for the engines of the *Andromeda* have arrived in the yard to bore out the ship and are now at work getting the aftermost lengths of shafting and the propellers in place. Preparations for her launch are proceeding apace. The groundways used for the *Renown* have been lengthened and the bilgeways are in readiness. It is reported that she will be coppered before being put into the water. *Apropos* of the want felt in preparing the plates for the protective deck of the *Andromeda* a large punching and shearing machine, capable of work on plates 2 in. thick has been placed in the fitting-shop. The *Spartia* is already being put together in a temporary manner in readiness for laying down and excellent progress has been made in getting material ready for her. The new machine will come in very usefully in the construction of the *Spartiate*, and will not only considerably expedite the preparation of many of her plates, but will materially reduce the outlay on labour. The *Hannibal* is not being pushed on very fast, if it had been considered expedient to advance her quickly to the stage at which vessels come from the private yards for completion, upwards of thousands of the men in the yard would have been employed upon her, but, instead of this, it is the *Andromeda* which has been pushed on and as there is no intention of lessening the rate at which she is being advanced, men must be taken from the *Hannibal* to work on the *Spartiate*. The assumption is, that if an emergency arose necessitating the speedy completion of the *Hannibal*, she would be sent to another yard at once.

The "Powerful" and "Terrible."

The Admiralty requirements for the steam trials of the *Powerful* and *Terrible* are that each ship shall make a trial of 30 hours' duration at 5,000 I.H.P., and at 18,000 I.H.P. respectively, for the purpose of ascertaining the coal consumption at these powers, and further, that they shall steam for four consecutive hours with the engines developing continuously the full specified H.P. of 25,000, to be followed immediately by another four consecutive hours with the engines developing continuously a H.P. of 22,000. The *Terrible* began these trials in August last and successfully accomplished the 30 hours' run at 5,000 I.H.P., the speed being 13·43 knots, revolution 64·5 per min., and coal consumption 2·57 lbs. per I.H.P. per hour. Owing to the fact that the engines required adjustment the second trial was postponed and up to date (November 25th) has not taken place. The *Powerful* began her trials in September, and in spite of bad weather also made a most successful essay. The results in her case were: speed, 14 knots; revolutions, 67·2 per min., and coal consumption 2·07 lbs. per I.H.P. per hour. The 30 hours' trial at 18,000 I.H.P. was begun on October 13th and was also most satisfactory. The results for the 30 hours are reported to have been: I.H.P., 18,438; revolutions, 102·8; coal consumption, 1·83 lbs. per I.H.P. per hour. On October 21st the four hours' trial at 25,000 I.H.P. was begun, but owing to an undue accumulation of heat in the casings of the ammunition passages, and in the vicinity of the funnels along the main and upper deck, the run was not completed. Both the *Powerful* and *Terrible* have since had their casings covered with silicate of cotton lagging, and their funnels have also been lengthened. It will be noticed that in the case of neither ship have the boilers caused trouble, the delays have arisen partly owing to defects in the machinery or construction, matters which admit of, and can, without difficulty, be remedied. In all probability the competition between Barrow and Clydebank as to which establishment should get its ship completed first is partly responsible for these matters. It is a matter of which all concerned in the design, construction and management of these vessels may be justly proud that they bid so far to fully equal the anticipations of those who were most sanguine of their ultimate success.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(From our own Correspondent.)

ORDERS for new tonnage have been very plentiful during November, and should it continue so the rest of the month, the result will be a three months' total of new work quite unprecedented in the annals of Clyde shipbuilding. The contracts for the first three weeks represent about 80,000 tons, bringing the total of new work placed since the beginning of September up to 335,000 tons. The boom, as will be seen, is meantime all in steamers, sailing ships being a drug in the market, and those shipbuilders who used to confine themselves to the construction of them are now devoting their energies to steamers, thereby adding considerably to the production, and overlapping the capacities of our engineering departments. Several establishments are enlarging their workshops, and the equilibrium will no doubt be readjusted in the season.

This phenomenal activity in placing new work has naturally led to unrest on the part of shipyard and engine-shop artisans in the matter of wages. But this contingency was to some extent anticipated, and much of the work recently secured is said to have been obtained at a figure which permits of some advance being given. It is understood that on the expiry of the agreement which expires on December 12th, between the Engineer Employers' Federation and the Amalgamated Society of Engineers, there will be a general demand by the men of the Clyde, the North-East Coast, and Belfast for an advance of wages, and what the men desire is said to be either a 51 hours' week at the wage paid at present for 54 hours, or the equivalent —an advance of a halfpenny an hour.

The Clyde Engineers' executive held a meeting on November 13th, when it was decided to ask the masters for a halfpenny an hour advance and a reduction of the weekly working hours from 54 to 53, which would place them on the same footing as the North-East Coast of England.

The members of the Boilermakers and Iron Shipbuilders' Society are now benefiting to the extent of 5 per cent. advance on previous rates, with their new agreement with the Federated Employers.

The Greenock Harbour Trust are endeavouring to bring before the Government the claims of Greenock as a terminus for the proposed new mail service to Canada. Sir Thos. Sutherland, M.P., has been approached, and he has promised to bring the matter before the authorities.

Messrs. Russell & Co., have been making an addition to their Kingston yard, Port-Glasgow, almost as large as the original. It is now completed, and they have now berthage accommodation for about 20 vessels, so that the whole of the order for 14 vessels received by them, can be all under construction at one time. This intelligence is causing a good deal of satisfaction in Port-Glasgow, as trade in that district has for some time been quiet.

Messrs. Scott & Co., Greenock, who carry on two yards, have been adding to their building space by reclaiming a considerable piece of foreshore, sufficient to give accommodation for two additional berths.

Messrs. The Fairfield Shipbuilding and Engineering Co., Limited, Govan, who launched on October 21st the cruiser *Diadem*, are laying down in the same slipway a similar cruiser, to be named the *Argonaut*.

Messrs. Jas. Black & Son, upholsterers, Greenock, have secured the contract to supply upholstery for four large steamers at present building on the Tyne.

Messrs. Russell & Co., shipbuilders, Port-Glasgow, have received orders for 14 large steel screw cargo-carrying steamers of upwards of 70,000 tons total deadweight carrying capacity. The orders for the machinery, which will all be triple-expansion, have been placed with engineering firms in the lower reaches. Messrs. Rankin & Blackmore have received orders for the construction of seven sets; Messrs. Kincaid & Co., Greenock, orders for the construction of six sets, and Messrs. Blackwood & Gordon, Port-Glasgow, have received an order for one set. Messrs. Russell & Co. have also booked a further order for two steamers to be employed in the passenger and cargo trade at Australian ports. They will be handsomely fitted throughout, and will each have accommodation for 40 saloon passengers. The machinery for both will be constructed by Glasgow engineers.

Messrs. Robert Duncan & Co., Port-Glasgow, are building a cargo-carrying steamer of medium tonnage.

Messrs. A. Rodger & Co., shipbuilders, Port-Glasgow, have contracted to build for London owners two steel screw steamers, each of 4,200 tons carrying capacity. Both steamers will be supplied with triple-expansion engines, and it is expected the order for their construction will be placed with a firm on the upper reaches of the Clyde. They have also secured from Messrs. Dawson Brothers, Glasgow, an order for a steel screw steamer, of 162 ft. length of keel, the first of several similar vessels proposed to be built for the same owners.

Messrs. William Hamilton & Co., shipbuilders, Port-Glasgow, have contracted to build for British owners, a three-masted sailing ship of about 3,600 tons deadweight carrying capacity.

Messrs. Wm. Denny Bros., Dumbarton, have contracted to build a steel screw cargo and passenger steamer of about 4,500 tons deadweight, for Messrs. Patrick Henderson & Co., Glasgow, to be used in their Glasgow, Liverpool, and Rangoon trade. They have secured an order to build seven light-draught paddle-boats for shipment to the East; and the London and North-Western Railway Co. have also placed an order with them for an express twin-screw steamer of high speed and large passenger accommodation, for their Dublin and Holyhead route. Messrs. Denny & Co., of Dumbarton, will build the engines for all these boats.

Messrs. A. M'Millan & Son, Limited, Dumbarton, have booked orders for two steamers.

Messrs. Chambers Brothers, boatbuilders, Greenock, have received an order for 12 of their patent lifeboats, from Messrs. Blohm & Voss, Hamburg, and also an order for some from Messrs. Scott & Co., Greenock.

Messrs. Carmichael, Maclean & Co., shipbuilders, Greenock, have contracted to build two steel screw cargo steamers for an English firm. The vessels will be 250 ft. and 225 ft. in length respectively, with a beam each of 36 ft. and 34 ft. They will be fitted with triple-expansion engines, constructed probably by a Greenock firm.

Messrs. Charles Connell & Co., shipbuilders, Scotstoun, have secured orders for two steamers, one of about 5,000 tons, to be built for Mr. E. B. Royden, of Liverpool, and the other, also for a Liverpool firm, of 11,000 tons carrying capacity.

Messrs. Barclay, Curle & Co., Whiteinch, have secured a contract for two large cargo-carrying steamers for London owners. They have also contracted to build for Messrs. Donald Currie & Co. a powerful passenger steamer with large cargo capacity, to measure nearly 6,000 tons register.

Messrs. James and George Thomson, Clydebank, have closed contracts with the Spanish Minister of Marine for two torpedo-boat destroyers, and the Atlantic liner *Paris* is to be repaired by them, also it is reported that an important contract for the Japanese Navy has been secured.

Messrs. S. M'Knight & Co., Ayr, have contracted for a cargo barge for shipment to Nagasaki (Japan).

Messrs. The Dundee Shipbuilders' Co. have received an order from the Bay Steam Line Fishing Co., Anstruther, to build a steam line fishing boat, her dimensions are—95 ft. long, 19 ft. 6 in. broad, and 10 ft. 9 in. depth, moulded, having a tonnage of about 100 tons.

Messrs. The Ailsa Shipbuilding Co., Troon, have contracted to build two steamers for Glasgow owners, one of 600 and the other of 1,700 tons carrying capacity.

Messrs. Flemming & Ferguson, Limited, shipbuilders and engineers, Paisley, have contracted to build a large twin-screw hopper dredger for the Waterford Harbour Commissioners. They have also received an order from the London County Council for two sets of triple-expansion engines at a cost of about £40,000.

Messrs. The London and Glasgow Shipbuilding Co., Govan, are building for themselves a steamer of about 3,500 tons gross, to be classed A1, and will carry about 6,000 tons deadweight. She is to be suitable for general trade.

Messrs. Hall, Russell & Co., shipbuilders, of Aberdeen, have received an order to build a steamer from Messrs. J. T. Rennie & Son, London and Aberdeen. The new vessel will be 340 ft. long and will have a gross registered tonnage of 3,000 tons.

Messrs. Ramage & Ferguson, shipbuilders, Leith, have secured, we understand, orders for four steam yachts and one cargo steamer.

Messrs. John Shearer & Son, shipbuilders, Kelvinhaugh, have contracted to build a steel-screw steamer, carrying 1,000 tons, for Messrs. Paton & Hendry, shipowners, Oswald Street, Glasgow, to be employed in their coasting trade. The new vessel is to have triple-expansion engines of full power, and to be fitted with all the most approved appliances.

Messrs. Mackie & Thomson, Govan, have received an order to build a small steamer of about 210 tons gross for the Day light Coast Passenger Traffic at Wellington, New Zealand. They have also contracted to build 10 fleeters and one carrier for Messrs. Haggerup, Doughty & Co., Grimsby. This is in addition to those at present on hand for the same firm, and makes a total of 35 fleeters and 3 carriers.

Messrs. Alex. Stephen & Son, Linthouse, Govan, have received contracts to build three large cargo carrying steamers of about 6,000 tons each.

Messrs. Wm. Simons & Co., Limited, Renfrew, have recently completed and delivered at Liverpool a very powerful bucket ladder dredger, fitted with a chain of steel buckets, each having a capacity to raise a ton weight of dredgings from a depth of 46 ft. Two sets of tri-compound engines and two boilers, constructed to Board of Trade, Lloyd's and Manchester Steam Users Association requirements for 180 lbs. pressure. Either set of engines is arranged to drive the bucket gearing as well as for propelling the vessel by twin screws. Electric light is fitted throughout. Weir's feed water heater and Harris's feed water filter. The *Lyster* was launched with all machinery fitted on board complete, including the buckets, and ready for work.

TRADE NOTES FROM THE TYNE, WEAR, TEES, HARTLEPOOLS, &c.

(*From our own Correspondent.*)

THE TYNE.

Shipbuilding.—The extraordinary demand for new tonnage, which arose quite suddenly and unexpectedly at the beginning of October, seems to have gained additional strength in November, and though freights have receded somewhat from the high standard reached in the former month, the circumstance does not seem to have in any way checked the placing of orders. Various estimates have been made as to the amount of tonnage ordered from Tyne builders within the past six weeks, or since the commencement of the present boom, but, most of them being founded on insufficient data, are probably a long way from the truth. Many shipbuilding firms evince a disinclination to give information on this point, believing that the publication of particulars acts as a kind of excitant upon certain sections of the workmen, causing them to make premature demands for advances of wages. The shipbuilders are, of course, within their right in withholding information respecting new orders, though the advantage of such reticence is not very apparent, seeing that the vessels cannot be hidden away while in construction. The circumstance, however, renders an accurate estimate of tonnage placed within a given time to be practically impossible; and keeping to the reservation here implied, we shall venture upon an estimate which will not be far from the mark, being founded partly on reliable information and partly on observation of the actual state of work in the yards. From these bases we arrive at the conclusion that in the period indicated between 140,000 and 150,000 tons of new merchant tonnage have been booked, independently of several important orders for battleships that have been secured by Messrs. Armstrong, Mitchell & Co. If the latter is taken into account, the tonnage booked will not be far short of 200,000 tons, which is about the amount usually turned out from the whole of the yards in an exceptionally busy year.

The rage for big cargo boats is becoming more strongly manifest every year, and in the present rush of work vessels of 5,000 tons capacity and upwards constitute a very large proportion of those ordered. One vessel building on the Tyne is over 12,000 tons, and this is by no means the highest point reached in cargo boats about to be built. The 2,000 and 3,000 ton boats of a few years ago are now fast becoming obsolete, and it is probable that the present briskness in shipbuilding will be continued until practically the whole of the old type vessels are displaced and superseded.

Two new building berths for battleships of the largest class are being formed at the Elswick yard of Messrs. Armstrong, Mitchell & Co. on ground that has recently been acquired. To ensure adequately strong foundations, massive piles are being driven in throughout the whole length of the berths, which will be about 500 ft., and to a width of some 60 ft. This work is being pushed on very energetically, as the first of the berths is wanted for a vessel of 11,000 tons displacement, ordered by the Japanese Government, and gangs of men are working night and day to get it ready. When the two additional berths are completed, this yard will have nine building berths in all.

The state of work at Messrs. Wood & Skinner's yard, Bill Quay, presents a marked contrast to the condition of affairs two months ago. Then there was only one small vessel in progress (a fishing boat), but now there are four large ones now on the stocks, and others, it is believed, in reserve. Two oil carrying vessels of large size have been laid down at Messrs. Armstrong, Mitchell & Co.'s Low Walker yard, the remainder of the berths being occupied with warships for the Norwegian and other foreign Governments. Messrs. Wigham Richardson's establishment continues extremely busy, and the same may be said of both Messrs. C. S. Swan & Hunter's yards, Wallsend. The Palmer Co. are also having their yards at Howdon and Jarrow fully occupied, and at Messrs. Stephenson's yard, Hebburn, preparations for commencing the building of a large pontoon dock are being made. Messrs. Hawthorn, Leslie & Co. are not at the moment particularly busy, and this is perhaps the only establishment on the river of which so much can be said. It is not but that the firm could get work if they cared to have it. It would be strange indeed if a firm of their reputation could not get orders at a time when others firms of lower standing in the commercial world are full to overflowing. There must be some other reason, for the absence of briskness in this case, beside the non-ability to get work, and it will probably transpire by-and-bye that the firm are merely reserving their building space for special work, which is no doubt already in view.

The Tyne Shipbuilding Co. are busy in the initiatory departments, and at Messrs. Readhead's yard exceptional briskness continues to exist. Messrs. W. Dobson & Co., have just booked an order for two moderate sized oil boats, intended for trading on the Caspian.

Engineering.—The activity in shipbuilding has, as a matter of course, re-acted on marine engineering, and all the establishments on the Tyne that are devoted to the latter branch of work are now having a full and in some cases an over supply of work. Skilled labour is scarcer than has been known for many years, one reason that is being assigned for this—in addition to the briskness in shipbuilding—being the development of the cycle trade, which has absorbed a very large proportion of the fitters, turners and machine hands that used formerly to be engaged in marine and general engineering work.

An engineering and electrical exhibition on an extensive scale is to be opened in Newcastle in February next, and a large building is being specially erected for it. One of the principal objects of the exhibition is to commemorate the 60th year of Her Majesty's reign, and this association with so remarkable an event gives the undertaking a very widespread interest. The available space for exhibits is being rapidly taken up, among the firms who have authorised space to be reserved being Messrs. Clark, Chapman & Co., Messrs. J. H. Holmes & Co., Messrs. Geo. Angus & Co., the Sunderland Forge and Engineering Co., Messrs. Thwaits & Co., of Bradford, Messrs. Tullis & Co., of Glasgow, &c., &c. Active progress is being made with the erection of the building, and there is no doubt that it will be ready for the opening in February.

Messrs. Noble & Lund, machine tool makers, Felling, have nearly completed the new wing to their works, and it is expected to be ready for occupation by the end of the year. The addition being quite as large as the original works, it is estimated that when the whole is in operation the productive capacity will be doubled. A very complete equipment of machinery will be put down in the new shop, which will be provided with electric travelling cranes. An installation of electrical plant, extensive enough to provide for the lighting of the whole establishment, and also to supply such power as may be needed for cranes, &c., is being put down, and other improvements are being effected with a view to put the establishment on a footing of equality with the best machine tool manufactories in the kingdom. Among the important contracts in hand at the present time are a very powerful 36 in. centre lathe for Messrs. Edwards & Sons, of Shields, which is intended for turning heavy shafting.

This machine will weigh 40 tons when completed, and the table is constructed to bear a 20-ton steel ignot. There is also a band saw on hand for a steel works near Glasgow, which will be capable of making a cut three feet deep, and is the largest machine of the kind the firm have yet manufactered. They have also, it may be stated, another large saw in hand for a leading shipbuilding and engineering firm on the Clyde, who have already four of these saws in operation in their works. In the department reserved for the manufacture of Mudd's patent piston rings great briskness exists, and many new orders have been recently booked. The firm have recently fitted with these piston rings the engines of a large steamer belonging to one of our leading Atlantic lines, and they are now arranging a contract for fitting a number of steamers of a similar class.

The Newburn Works of Messrs. John Spencer & Sons are now exceedingly busy in all the principal departments, the plate rolling mills being particularly pressed with work. The forging department at Ouseburn is also very fully employed, the work in hand consisting mainly of shafting, crank shafts, stern frames, and rudders.

The works of Messrs. Emmerson, Walker, and Thompson Bros. are, as might be expected, considering the "boom" in shipping, very full of orders just now, and several of the departments are kept working night and day.

Messrs. Clarke, Chapman & Co. are also having as much as they can do, and indeed, all firms catering for steamship requirements in the matter of auxiliary machinery, may be said to be similary situated.

Messrs. Crosier & Stephens the well-known merchants and machinery agents, have removed their offices and stores from No. 26, Collingwood Street, Newcastle, to more commodious premises at No. 2, Collingwood Street. Having now plenty of room, an advantage they formerly lacked, the firm will be in a position to fulfil the requirements of their clients, with promptitude and dispatch. Among the specialities for which this firm are agents in the Northern Counties, is that well-known fuel economiser, the Meldrum Furnace, which has invariably given satisfaction where it has been applied in connection with land engines. It has now been adapted to marine purposes, and is already successfully in use on several steamers, the economical results being most noteworthy.

THE WEAR.

Shipbuilding.—Judging by the appearance of the yards, it cannot be doubted that Sunderland builders are getting their full share of the orders that are going. Every yard has one or more keels being placed in position, and at one establishment there are no less than five large vessels in the very earliest stages of building. Messrs. Doxford have two or three large "turret" ships building for Messrs. Wilson, of Hull, and several more for other owners of equal high standing. The two large torpedo destroyers which this firm are building for the Admiralty, are in advanced stages of construction.

Messrs. Short Bros. have successfully adopted electricity for driving a large portion of the machinery in their shipyard. A motor has been fitted in connection with each machine to be electrically driven, and the result has proved to be in every way satisfactory. This firm are understood to have an exceptionally large amount of work on their books, and the frame bending and adjusting departments are kept working night and day. These departments are also on double shift at several other yards.

At the North Sands Yard (Messrs. J. L. Thompson & Sons) the state of business has undergone a marked improvement within the past few weeks, and all the berths are now occupied, either with vessels in progress or with keels just laid.

The second of two Japanese steamers, ordered during the summer months, is nearly ready for launching, which says much for the methods and resources of the establishment, in so far as regards the giving of quick delivery. A remarkably fine steamer, the *Lavinia*, is being fitted out at the firm's Manor Quay works, after having been engined at the works of Messrs. George Clark, Limited.

The Strand Shipbuilding Co. have received an order from local owners for a steamer of about 2,000 tons capacity, and it is believed that other orders have been booked. Messrs. Austin & Sons have also added to their order book, and are as busy as could be wished in the repairing department.

The Sunderland Shipbuilding Co. have secured an order for a steamer of considerable dimensions and superior type. It will, it is understood, be built on fine lines, as a high rate of speed is wanted. There are two vessels now on the stocks in rather early stages of construction, and it is expected that the yard will be kept busy during the winter months. The adjoining yard (Messrs. Bertram & Sons') are well supplied with work, having some half-dozen steamers of a large class to build.

Builders of ship's boats are now busier than they have been for years, though not so busy as, under present circumstances, they undoubtedly would have been, had steel not come into competition with wood, as a material for building such boats. It is still a moot point as to which is the more suitable material, as though steel may endure longer, wood is unquestionably the more buoyant material, and it is quite conceivable that a properly constructed boat, made from sound "seasoned" timber, would be better to rely upon in a case of emergency, than the strongest steel boat that was ever manufactured, and would also, if properly treated, last quite as long.

Engineering.—A large order for the engines and boilers of six good sized steamers has been recently placed with Messrs. George Clark, Limited, and it is understood that the ships, which are for Hamburg owners, are also to be built on the Wear. The other marine engine works are as busy as possible, and in nearly all cases work is being carried on night and day The Sunderland Forge and Engineering Co., Pallion, have important contracts in both the electrical and forging departments and considerable briskness exists throughout.

The Wreath Quay Engineering Works, which were started in the early part of last year by Messrs. Jameson & MacColl, and which were carried on with great success up to a few months ago, when the death of Mr. Jameson caused a temporary hindrance to business, and made new arrangements imperative. Mr. MacColl has now entered into partnership with Mr. Gilbert Pollock, of Hyde, near Manchester, and the works will in future be carried on by these gentlemen, under the designation of MacColl & Pollock. The new partnership has commenced under very favourable auspices, there being already fully six months work on hand, which includes, among other contracts, two sets of engines for Tees shipbuilders, which, with the boilers, are considerably larger than any yet constructed at the works. Under the old régimé, which lasted only a few months, the firm built and fitted the machinery for four vessels, besides making five donkey boilers for large ships built on the Wear, and also doing a large amount of general repair work, including the fitting of a new crank shaft in the s.s. *Ocean King*. The firm are now in a position to contract for the construction of marine engines and boilers up to 600 I.H.P. (with one boiler) and 1,000 I.H.P with two boilers; besides horizontal or vertical multitubular donkey boilers for high pressures, also for repair work in general, including re-boilering and the conversion of compound engines into triple-expansion.

Foundries and forges, and also brass and copper works, are kept very actively going, and at Messrs. Wm. Mills' aluminium and brassfounding establishment the brisk state of business mentioned in a former issue is fully maintained.

The Hartlepools.—Shipbuilding, which throughout the summer months was unusually slack for this centre, is now showing changed conditions, and in a little while rather more than the customary activity will be witnessed. Since September 19th, the following vessels, engined by Messrs. Thomas Richardson & Sons, have proceeded to sea after satisfactory trials;—

On the date named, the s.s. *Maceio*, built by Sir Raylton Dixon & Co. for the Hamburg South American Co., left Middlesbrough for her official trials in Tees Bay. The vessel is of the spar-deck type, built to the Bureau Veritas highest class, and especially designed and fitted to suit the company's passenger and general trade to Rio Grande. Her principal dimensions are

310 ft. 6 in. by 41 ft. 2 in., and 28 ft. deep, having a deadweight carrying capacity of about 4,000 tons on a very light draught. The first-class passenger accommodation is fitted up under the bridge, with dining-saloon and house on bridge-deck. Commodious and well-ventilated quarters for about 326 emigrants are also provided aft in poop and 'tween decks. The *Maceio* is a sister ship to the *Taquary*, built by Messrs. Dixon & Co. and engined by Messrs. Richardson for the same owners in July last, the machinery being triple-expansion, with boilers working at 210 lbs. pressure. The cylinders are 20 in., 33 in., 57 in., by 45 in. stroke, and the engine-room is replete with all modern accessories for economic working. During construction the ship and engines were under the personal supervision of Mr. Dietxe, the company's engineer. At the conclusion of the trials the vessel proceeded to Hamburg to load for South America.

On October 17th the s.s. *Huron*, built by Messrs. J. L. Thompson & Sons, Sunderland, for the Mercantile Steamship Co., of London, left the yard of the builders for progressive trials on the measured mile at Whitley. The vessel is a handsome specimen of the modern cargo boat, measuring over 320 ft. in length, and with a large carrying capacity. The engine cylinders are 24 in., 38 in., 64 in., by 42 in. stroke, and the two large single-ended boilers work at 160 lbs. pressure.

On October 26th the s.s. *Sunningdale*, built by Messrs. Ropner & Son for Messrs. John Wood & Co., of West Hartlepool, had a very successful trial trip from the Tees to the Tyne. The cylinders are 21½ in., 35 in., 59 in., by 39 in. stroke, with two boilers to work at 160 lbs. The machinery has been constructed under the superintendence of Mr. Craig, of West Hartlepool.

The following vessels are having their machinery put on board:—The s.s. *Scottish King*, built by Messrs. Short Bros. for Messrs. Ronaldson, of London and Antwerp, for their South American trade; the s.s. *Apollo*, built by Messrs. Furness, Withy & Co., Limited, to the order of John Lockie, Esq., of Newcastle; and the s.s. *Leopoldville*, built by Sir Raylton Dixon & Co. for the Compagne Belge Maritime du Congo.

Since the completion of the extensions which Messrs. Richardson have recently made in connection with their forge department they have executed a very large quantity of heavy and important work. As an instance of the quick despatch which the firm are now enabled to give their customers, we may mention the case of the s.s. *Rossmore*, for which a propeller shaft 16 in. diameter by 25 ft. long, and weighing 8 tons, was urgently required. The order was received at 3 p.m. on Wednesday, November 11th, and the shaft was delivered complete in Liverpool at mid-day on the following Sunday, the 15th inst.

Stockton.—Messrs. Craig, Taylor & Co. have on the stocks three or four 3,000 ton steamers for the Black Sea trade, and a rather fast collier—11 knots speed—for Goole. They have just received an order from Liverpool owners for a steamer of 6,600 tons carrying capacity, and there is now no reason to doubt that the yard will be kept busy for some months. The other yards at Stockton are also well supplied with work, and the engineering establishments are without exception busy.

Middlesbro'.—This centre has shared in the general improvement in shipbuilding, and the two principal yards are likely to be busy for some time to come. Steel works are extremely busy, and the prices of plates and bars for shipbuilding are firm at the recent advance.

Consett.—The works of the Consett Iron Co., which for many years past have scarcely been any other way than busy, are now even busier than usual, there being quite a plethora of orders. The weekly output is considerably above what it has been at any ormer time.

THE MERSEY.

(*From our own Correspondent.*)

ALL branches of the engineering trades throughout this district are in a more active condition, and with better prospects for the immediate future than has been the case for a very considerable time past. This applies particularly to every branch of engineering connected with the marine industry, the exceptional activity in all the large shipbuilding yards bringing forward enquiries for heavy tools and other requirements, which are giving a large amount of work to engineers in this district. In fact most of the principal engineering establishments are so full of orders that they can scarcely undertake new work for anything like early delivery. Machine tool makers, especially, are extremely busy, and many of the leading firms have had to decline a considerable amount of new work, owing to their inability to comply with requirements as to delivery. Boiler makers also continue well engaged; stationary engine builders are kept fully going; locomotive builders generally have work in hand to keep them well employed for a considerable time forward, one local firm having secured an order for between 30 and 40 engines, which are required for the Japanese Government railways, whilst all the general engineering trades are in a very satiefactory position both as regards orders on the books, and the outlook for the immediate future.

The usual monthly returns of the principal engineering trades' unions afford unmistakable evidence of the activity in trade referred to above, the reports just to hand showing a continued decrease in the unemployed list. The Amalgamated Society of Engineers has now only 2⅓ per cent. of the total membership on out-of-work benefit, whilst in this immediate district there are not more than one per cent. of the local membership on support, all the shops being fully employed. With regard to the Steam Engine Makers' Society, the returns show about one per cent. on donation, which is about the same as last month. The reports as to the state of trade continue very encouraging, exceptional activity being the general report, with no indications of any falling off in the improvement that has recently set in. The demands for higher wages in various engineering centres are being gradually settled, but the men are still on strike in one or two districts.

The position in the shipbuilding industry on the Mersey is reported as fairly satisfactory, both as regards the amount of work in hand, and the number of enquiries which are being received. Messrs. Laird Bros., Birkenhead, have during the month launched two of the six torpedo-boat destroyers which they are building for the British Navy. The first of these was the *Ernest*, which was launched on the 7th November, and the second the *Griffon*, launched on the 21st, and both of these, after the ceremony was over, were taken to the Alfred Dock, and Messrs. Laird's fitting-out wharf, in order to receive their machinery. Rapid progress is being made with the construction of the other vessels of this class which th firm have in hand. It may also be mentioned that the *Virago*, one of the destroyers previously built by Messrs. Laird, has, during the month, passed through a very satisfactory trial on the measured mile at Skelmorlie, the average for six runs at 216 lbs. mean steam pressure, being 30·508 knots. The battleship *Mars* will, we understand, be leaving for the dockyards in a month or six weeks. With regard to the Irish mail boats which the firm have on order, the *Ulster* has been taken out for preliminary trial during the month, and the results obtained were in every way satisfactory.

A new regulator for steam boilers is being put on the market by the Pressure Regulator Co., West King Street, Manchester, the object of the invention being to maintain a steady pressure by controlling the damper, the mechanical stoker or both, the supply of air to the fires, in the one case, and the supply of fuel in the other being regulated according to the variations in steam-pressure. The chief feature in this regulator is that it holds the damper open or shut, or at any intermediate position, so long as the pressure in the boiler requires it, the regulator moving the damper from open to shut, or *vice versa*, by graduated steps, according to the pressure. The regulator essentially consists of a pressure device for the purpose of weighing the steam-pressure in the boiler, the motive power for working the damper or stoker being water, under a suitable pressure. There is a direct push and pull upon the damper or stoker, and to overcome frictional resistance to the action of the regulator, an ingeniously-designed intermediate lever arrangement has been introduced. It is claimed that, besides preventing black smoke, the adoption of this regulator will effect a saving of 7½ to 15 per cent. in the coal bill, whilst the apparatus also prevents waste through blowing off, and acts as a safety-device. The regulator is in use at the Manchester Electric Light Station, where it is giving very satisfactory results.

Mr. J. K. Broadbent, of Salford, is introducing an improvement in his patent boiler apparatus, consisting of a new forced draught arrangement with enclosed ashpit, combined with his usual smoke-preventing device. In this apparatus two automatic valves are provided, one on each side of the front deadplate, and these discharge into a kind of horse-shoe box, perforated at the front with half-inch holes. On the furnace door being opened, a bell crank attached to the hinge pin operates a lever, which causes the two automatic valves to open, thus relieving the pressure under the bars, and blowing the hot air in the direction of the heated current. These valves are then actuated by a self-acting regulator, which by moving a slide on a lever, shuts the valves down in any required time, from one to eight minutes. The appliance is specially useful in all cases where furnaces are crippled owing to deficient draught, or where the boilers are overworked, or where additional steam generating power is required.

The advantages secured by the use of solidified oils in place of liquid oils, for the lubrication of marine shafts, bearings, cranks, &c., are now becoming generally recognised, and the only drawback to their adoption has been the high prices asked for them, ranging from 9d. to 2s. 3d. per ton. Though even at these figures the use of solid lubricants was more economical than that of liquid oil, there has been a widespread desire for a reliable solidified oil, at a moderate price. Messrs. J. S. Morris & Sons, Victoria Bridge Works, Manchester, have been conducting a number of experiments with a view of securing the above desideratum, and are now enabled to place before machinery users a new solid lubricant, registered under the name of "Osyl," which is supplied at 42s. per cwt. It is claimed that 1 lb. of this oil will last fifteen times as long as good shafting oil, thus effecting a considerable saving in the cost of lubrication, whilst increased power and efficiency of machinery is also secured, owing largely to the success with which friction is overcome. The advantages attaching to the use of "Osyl" are specially apparent in connection with the lubrication of propeller shafts, which usually necessitates such a large expenditure of oil, and where consequently the economy effected by the adoption of the new oil will be greatly appreciated.

On Wednesday last, at a meeting of the Manchester Association of students in connection with the Institution of Civil Engineers, Mr. M. Longridge, M.A., M. Inst. C.E., in the chair, Mr. B. Stephenson read an interesting paper on "Some recent Improvements in Marine Engineering." The author first dealt with the reasons which led to the use of higher pressure and multiple expansion engines, and the ratio of cylinders adopted in mercantile and naval work. This was followed by a few remarks on the arrangements of triple and quadruple engines, and the balancing of these at high piston speeds, whilst attention was also directed to the comparative economy of the triple and compound engines of some of the Atlantic liners and other merchant steamers. Some interesting data were given of the consumption and other trials of warships, both for our own and foreign navies, and the uses and arrangements of artificial draught and the consequent saving in the weight of boilers were also explained, after which the author passed under review the comparative weights of machinery in mercantile and naval ships, and the advantages secured by the adoption of water-tube boilers for steamers, the paper concluding with some notes on the materials used in the construction of light engines running at high speeds. In the discussion which followed, Messrs. Longridge, Constantine, Adams, Pafarel and Winder took part, the proceedings closing with the usual vote of thanks.

At the opening sessional meeting, held on November 11th, the President, Mr. C. S. Allott, read an instructive paper on the improvements that have been made in bridge construction, and the machinery now employed in this class of work.

The facilities afforded by the Manchester Ship Canal Co. for the importation of pig-iron, billets, &c., to Manchester and subsequent storage at the Manchester and Salford Docks, appear to be fully appreciated by merchants and consumers in this district, and the Pomona Docks are rapidly becoming an important centre for this branch of trade. The company have adopted a system for dealing with pig-iron on lines somewhat similar to the plan adopted at the Glasgow and Middlesbrough warrant stores, but local importers have at the Manchester docks the important advantage of being able to make arrangements with the company for storing pig-iron free of rent charge. The tolls and wharfage for the use of the Canal between Eastham and Manchester, are 1s. 6d. per ton on pig-iron, and 1s. 8d. on billets, blooms and ingots, and the only other charges are for handling and weighing, 8d. per ton on pig-iron, and 4d. on billets, &c., being levied on receiving the cargo from the ship, weighing, loading the cargoes direct ex ship, or taking into stock, with similar charges for reloading and reweighing over the weigh-bridge. Earlier in the year stocks were rapidly accumulated at the docks, until at the end of July, 30,000 tons of pig-iron were held in storage. The increase in prices, and the upward move in freights have, however, led to a gradual decrease in the deliveries at the docks, and on the occasion of a visit paid at the commencement of the past month, there were only about 20,000 tons in store. The bulk of the iron at the Pomona Docks consist of Scotch brands, with a small proportion of Middlesbrough, the latter iron being chiefly delivered at the Salford Docks, which are more convenient for vessels from the North of England.

In the iron trade there has been a continued strong upward move in prices, and although no very great weight of business has been put through, most of the large consumers being well covered for the present, there is a fair enquiry stirring. Makers hold firmly to their quoted rates, and are generally so well sold that they are either practically out of the market, or very indifferent about booking, whilst merchants are also very cautious. Local pig iron has gone up about 6d. for foundry and 1s. for forge; 47s. 6d. less 2½ for foundry, delivered Manchester, and 45s. 6d. less 2½ for forge, delivered Warrington, being now the average quotations. In district brands Lincolnshire foundry has been advanced 1s. per ton, and is now quoted 46s. 6d. net cash, with forge qualities firm at 43s. 6d. net, delivered Manchester; whilst Derbyshire foundry now averages 48s. to 50s. net cash, delivered Manchester. Outside brands have also shown a substantial upward move, good foundry Middlesbrough being quoted 49s. 4d. net cash, delivered by rail, and 47s. 6d. delivered Dock Quays, Manchester; with Scotch iron 51s. 9d. to 52s. 3d. for Eglinton and Glengarnock, and 55s. 3d. to 55s. 6d. for Gartsherrie, net prompt cash, delivered Manchester Docks.

In the finished iron trade local makers are generally well booked over the next few months, and are asking considerably advanced prices for bars, which would now be difficult to buy under £5 17s. 6d., with £6 quoted in some cases. Sheets are also stronger, £7 5s. to £7 10s. representing about the average figures. Hoops remain at £6 5s. for random to £6 10s. for special cut lengths, delivered Manchester district, and 2s. 6d. less for shipment, but although there is only a slow demand, it is not improbable that makers may shortly follow the upward movement which has been going on in bars.

A decided hardening in prices is also reported in the steel trade, a general advance on late rates having taken place. Good foundry hematites are now quoted 60s. less 2½; local billets, £5 net cash; bars, £6 2s. 6d. to £6 5s.; and boiler plates, £6 15s. to £7, delivered Manchester district.

In the metal market there has been an advance of ¼d. per lb. on brazed brass tubes, brass and copper wire, and rolled brass and an active demand comes forward at the full quotations. List prices, delivered Manchester district, are now as under:—Solid-drawn brass boiler tubes, 7d.; solid-drawn brass surface condenser tubes, 8½d.; solid-drawn copper tubes, 8½d.; brazed copper gas and steam tubes, 8¼d.; brazed brass gas tube, 7¾d.; brass wire, 6½d.; copper wire, 7¼d.; and rolled brass, 6d. per lb. On brazed tubes and brass and copper wire makers are now asking ¼d. to ½d. per lb. above the official rates, as they are so heavily sold that they do not care to book further at the old rates.

The timber market shows no material change; stocks are ample, with prices generally unaltered. In East India teak imports have been moderate, with a fair enquiry, and a slight improvement in prices. Only one cargo of Greenheart has arrived; prices are higher and stocks moderate.

A substantial improvement has taken place in the coal trade during the past month. All descriptions of round coal have been moving away satisfactorily, and pits are now working five to six days per week, whilst prices have shown a decided hardening tendency. House coals are in good demand, and an advance of 6d. per ton on late rates is being obtained without difficulty, best Wigan Arley now averaging 10s. 6d. to 11s.; Pemberton four foot and seconds Arley, 8s. 6d. to 9s.; and common house coal, 7s. to 7s. 6d. per ton, at the pit-mouth. Steam and forge descriptions are also in improved demand, with better prices ruling, ordinary qualities now fetching about 6s. 6s. per ton, at the pit. Engine fuel is rather variable, the better sorts being in active request, and rather scarce, whilst common slack is if anything more plentiful in the market. Prices, however, are rather higher than last month, averaging 3s. 6d. for common; 4s. 3d. for medium sorts, and 4s. 6d. to 5s. for best qualities at the pit-mouth.

The shipping trade has shown a welcome revival of activity and a considerable weight of business has been done, with prices advanced about 1s. on late quotations, 7s. 9d. to 8s. 3d. being now the average for ordinary steam coal, delivered Mersey ports.

BELFAST TRADE NOTES.

(From our own Correspondent.)

THE amount of shipbuilding and engineering work in hand and on order here at present can only be described as phenomenal. Both the large firms are full up, in fact it was stated at the annual reunion of the Amalgamated Engineers (Belfast branch) that Messrs. Harland & Wolff had secured sufficient orders to guarantee everyone of their slips being kept full for at least fifteen months to come. Messrs. Workman, Clark & Co. follow very closely on their heels in this respect, but unfortunately the destruction of their engine works by the recent fire handicaps them considerably.

Of course this agreeable prospect has always a more or less disturbing influence in the desire of someone or other of the men's societies for an increased wage. This time the engineers have set the ball a-rolling. The mutual agreement between them and the Federated Employers comes to an end shortly, and, as by its terms a full month's notice on either side of any proposed change is necessary the Engineers' Society have now sent in their demand for an increase. This demand is now under consideration by the employers, but it is not expected any serious trouble will ensue.

Among the orders Messrs. Harland & Wolff are credited with having booked lately, is one for a large steamer for the Netherlands-American Steam Navigation Co. The vessel will be 510 ft. long by 59 ft. beam by 43 ft. deep, and her deadweight capacity will be about 10,000 tons. Her propelling machinery will consist of twin-screw engines of about 7,000 I.H.P., and the probable speed of the vessel will be 16 or 17 knots per hour. Accommodation will be provided for 350 cabin and a large number of steerage passengers, and the new steamer will embody all the latest improvements throughout.

Messrs. Harland & Wolff launched during the month, from the southern end of their yard, the s.s. *Arabia*, the second of the two sister ships for the Hamburg-American Steam Packet Co. These two vessels are intended to run in the company's North Atlantic trade. They have each a gross tonnage of about 5,540, and are built to the highest class of Germanischer Lloyd's. The vessels have accommodation for 300 steerage passengers, and will be fitted up with all the latest mechanical devices for handling cargo rapidly, as also with a refrigerating plant and a complete installation of electric light. The engines for the vessels will consist of one set each of quadruple-expansion engines, similar in design to those of the s.s. *Pennsylvania*, for the same owners. On the occasion of the launch the owners were represented by Inspector Van Der Smissen and Captain Kopff.

The new steamer *China*, for the Peninsular and Oriental Co., is now almost complete. The trial trip will take place in Belfast Lough at the end of November, after which the vessel will be brought back to have engines opened up and examined, after which she will leave for London to take up her sailings. The vessel has two funnels and two pole masts, and presents a very fine appearance from the outside. The interior of the vessel has been fitted up very handsomely.

Another steamer, viz., the *European*, will leave very shortly. This vessel was launched about last July or August, but the engines being very far behind have detained her till now. The *European* has been built to the order of the Western Pacific Co., Liverpool.

The twin-screw steamer *Pennsylvania*, for the Hamburg-American Co., has now received her engines and boilers, and the work of completion is being pushed forward rapidly, but there is over two months' work on her yet.

This leaves four other new steamers in the Abercorn basin ready to receive machinery. These are the *Gascon*, *Gaika*, *Arcadia*, and *Arabia*. Two more vessels will be launched before Christmas, so it is evident that the total tonnage for the year will reach a handsome figure.

Messrs. Workman, Clark & Co. also intend launching two steamers before Christmas. The s.s. *Magician*, for Messrs. T. & J. Harrison, ran her trial trip successfully in the Lough, and proceeded direct for New Orleans.

NORTH-WEST OF ENGLAND.

(From our own Correspondent.)

Barrow.—Although no new orders have been booked during the month by local builders, the position of affairs, generally speaking, is very satisfactory, as plenty of work is in hand, and prospects may be considered good all round. There is a fair enquiry for new tonnage, but unfortunately prices range low, and builders have to choose between very little profit or no profit at all, or allow orders to go past them. The value of material is very firm, and current prices have led to an increase in the quotation per ton of ships contracted for. There are not many orders in the market for the better class of ships, and builders whose yards are adapted for high-class work have to be content with what they can get. This position has led to greater attention being paid by many builders to Admiralty work, with the result that more and more competitors are in the field year by year for the orders which the Admiralty are prepared to place in the hands of private builders. The tenders are almost ready to go in for the three second-class cruisers required by the Admiralty in this year's programme, and the Barrow Co. is one of the firms which is offering to build one or two of these ships. They are to be of the *Juno* and *Doris* class, with the exception that Belleville boilers will take the place of the ordinary cylindrical type of generators. Those builders who have had most experience in the construction of Belleville boilers should stand the best chance of securing these contracts, the successful tenderers for which will doubtless be made known before Christmas. In reference to Belleville boilers, it is an interesting fact that the demand for steel tubes has become so marked and so pressing that makers who are capable of making a good reliable article to stand Admiralty and other tests find it difficult to cope with users' requirements. It is generally felt in Barrow that special works ought to be founded for this manufacture. Work is kept back in many shipbuilding yards in consequence of the numerous orders held by makers, who in many cases are six months behindhand with their deliveries. It is noticeable that works employed in the tube trade are all earning large dividends. Barrow should certainly be one of the homes of this trade, as it has not only the best of steel in its midst in plentiful supply, but by means of the docks at Barrow, cheap facilities of shipment. The *Barrow News* points out, there is to be begin with a good local demand for steel tubes, and the large users of these tubes at Liverpool, Belfast, Glasgow, and at the Government dockyards could be supplied at low cost of carriage from works at Barrow. Further than this there is the fact that if more of the many articles required in shipbuilding and engineering work could be produced in Barrow it would have the tendency to cheapen the cost of the ships and engines built here, and thus local builders would be more able to compete successfully for any orders in the market. The steel tube industry is one that promises to be very successful if established in Barrow, and if those anxious to promote the prosperity of the place in the future would devote some attention to this question good would result. Local capitalists would gladly subscribe to any company promoted to carry on this work, and outside capital would readily come in to supplement local effort. There are two industries which certainly ought to be started in Barrow, one for the manufacture of steel tubes, and another for the production of forgings. If these were once created, smaller industries would follow, because the need for subsidiary works of minor importance, but with equal chance of success, would be demonstrated, and confidence would be created in a way that would encourage in the best way possible the employment of new capital with a view to the development of the natural resources of a district admirably adapted for many special trades that are not at present in existence in our midst. Speaking at a banquet given by the Mayor of Barrow on November 5th, Mr. J. M. While general manager of the Barrow Steel Works, spoke of the desirability of founding new industries of minor importance to those already in existence, but of kindred character, to act as feeders to the parent industries, and it is probable in the near future something will be the outcome of this, as there is a local as well as an outside desire to promote and develop the trade of Barrow in those natural directions which common sense and the necessities and economics of trade seem to justify. During the month H.M.S. *Otter*, one of the four torpedo boats building at Barrow for the Admiralty, was launched, and her sister ships, the *Leopard* and *Bittern*, will also soon be launched. The *Otter* and the *Bittern* have been built at the end of the ways on which the new first-class cruiser *Amphitrite* is being laid down. This work is proceeding very satisfactorily and the keel plates are already being put down. Her sister ship, the *Niobe*, is ready for launching, but it is the system for the sake of convenience and economy to launch ships at Barrow with plenty of weight on them as the ground is good and solid, and the shipbuilding department is always anxious to get as much of their share of the work done as soon as possible before the ships are launched and taken round to the engineering side of the yard. It is, therefore, not yet known whether the *Niobe* will be launched this year or not. In the course of a couple of months at least the Barrow and Belfast steamer, *Duchess of Devonshire*, will be launched, as she has to be ready for her station in the spring of next year, and so also have the two twin-screw Channel steamers for the Great Western Railway Co. Much satisfaction is felt at Barrow at the successful trial trips of the second-class-cruisers *Juno* and *Doris* at Devonport, and also at the marked success of the preliminary trials of the first-class cruiser *Powerful*. The final full-power trial failed when the power indicated was within 300 horses of the 25,000 H.P. required. The failure was due to unscientific stoking and to the combustion of the steam from the boilers in the uptake to the funnels. It should be noted also that on the occasion of the full power trial the *Powerful* had one of her 48 boilers laid off owing to a leaky feed pipe, and thus was robbed of 500 or 600 H.P., or more than sufficient to cover the deficiency. This accident, which is not derogatory or indicative of a bad job, has, however, led to several alterations being made in the uptake of the cruiser's boilers, and an additional 10 ft. has been added to the funnels alike of the *Powerful* and the *Terrible*. The final trials of the *Powerful*, which will take place in a few days, are looked forward to with much interest, not only in Barrow and by the builders and the Admiralty, but by the engineering world generally, as a proof in actual operation of the efficiency of the Belleville boilers as steam generators, and as to their capacity in keeping up steam pressures continuously. The fact that the Admiralty is ordering all boilers in the new first and second-class cruisers of the Belleville type is proof that they are quite satisfied with the principle as applied to large and small warships alike. Much has been said and written during the past month or two with reference to the black cat which the Barrow Co. is said always to carry on steamers built at that port, in order to ensure successful trial trips. Of course, this is all a farce. Barrow builders are in no sense dependent upon the agencies which helped Dr. Nikola in his adventurous enterprises, and the only black cats employed are the burly sons of Vulcan who do good work for their employers, and are always ready to show the success of their work on trial trips. It is a remarkable fact that for years past Barrow-built ships have been conspicuously successful on trial, and there is every reason to believe the *Powerful*, which may be regarded more or less as an experiment, will be no exception to the general rule. Some of the newspapers printed and circulated at Plymouth, Devonport, and Portsmouth, have once or twice pointed out the unfairness which frequently is shown to Barrow and other builders by Admiralty officials when certain builders on the Clyde have interests to serve, but no apprehension need be feared on that score so long as the character of the work turned out secures as at present the confidence of the Admiralty and of the country. Repair orders are plentiful at present, and the belief is generally entertained that several old steamers will soon be either broken up or tripled and modernized, as the new tonnage is gradually wiping out the old tonnage, and making it impossible to work it profitably. Mr. W. Charlton, who for years was secretary of the Barrow Shipbuilding Co., and who has been works secretary of the Naval Construction and Armaments Co. since the formation of that company, has retired from his post at the age of 65 years, and Mr. Archibald Miller, the secretary of the company, who has resided in London, has removed to Barrow, where all secretarial duties, including Stock Exchange business, will in future be carried on. The office in St. Swithin's Lane, London, will, however, be kept on. In all departments of the local shipbuilding and engineering trades the most pleasant and amicable relations are maintained between masters and workmen. Engineers are very busy in their department, but boilermakers are not so busy, as much of the work incidental to Belleville boilers has to be undertaken by the engineers.

Whitehaven.—Some further overtures have been made at Whitehaven with Lord Lonsdale as to the restarting of the old shipyard. His lordship, in a speech delivered on the occasion of a banquet given to him at the conclusion of his year of office as mayor of the borough, said he had every desire to see the business and trade of Whitehaven in a flourishing condition. When asked to help to revive the shipbuilding trade of Whitehaven, his reply was that he would do anything he could in that direction if it could be shown to him that it would be a paying business. He depended on these matters on the opinion of practical experts, and if they showed him that shipbuilding could be successfully and profitably conducted here, he would help the scheme; but if he felt that any scheme for the resuscitation of Whitehaven's trade was likely to be a failure, his price for the requisite land would be £10,000 per square inch. As Lord Lonsdale is the owner of the present shipbuilding yard, the question at issue depends on the practical advice of his friends.

West Cumberland.—There is a steadiness and activity in the shipbuilding trade of Workington and Maryport, which have for long been its characteristic. No new orders are reported, but builders are busy on old contracts, and there are new ones for them wherever they are ready to accept.

Shipbuilding Material.—The market for all classes of shipbuilding material is strong and healthful. In this district this fact is particularly noticeable in reference to plates, light and heavy, various sections, and heavy steel castings. Orders for all these items in shipbuilding requirements are largely held, and the market is brisk in enquiries for forward delivery, private shipbuilders, as well as the Admiralty, being large buyers. Prices are very firm all round. Several orders for heavy steel castings are now coming to Barrow from engineers on the Thames, as well as Liverpool, the Clyde, and Belfast.

The Hematite Trade.—Much briskness is noticeable in the hematite pig-iron trade. Makers are in receipt of plenty of orders, and with their 36 furnaces in blast there is a regular and liberal output of pig-iron, all of which is going into immediate consumption. The stocks held throughout the district have now been reduced to less than 300,000 tons. Prices are higher at 51s. to 51s. 6d. per ton, net f.o.b., for mixed Bessemer numbers.

Shipping.—A brisker tone is reported in the shipping trade, and the exports of pig-iron and steel are still shown to be much in excess of last year. This is more particularly the fact as regards steel. Freights are rather better all round.

Pensions in the Merchant Navy.—The nature of the sailor's calling has hitherto rendered it difficult for him to make provision by insurance for old age or death, and, realising the hardship this entails, the White Star Line has determined to render assistance by establishing a system of life assurance and superannuation, towards which the company and its officers mutually contribute, the latter by payment out of their bonus. Officers of the White Star fleet are thus enabled to look forward to a substantional allowance on retirement, as well as to a payment after their death to those who may have been dependent upon them. This new arrangement has been in operation since the 1st of January, 1895, and solves a problem which has always been more or less of a difficulty with a class of men exceptionally in need of the benefits to be derived from insurance. To illustrate the advantages this arrangement will confer, it may be stated that a White Star Line commander 33 years of age will be entitled, on attaining the age of 60, to an allowance of £298 8s. per annum, and upon his death, whenever that may happen, the sum of £2,984 will be payable to his family or legal representatives.

Armoured Torpedo Destroyers.—On Friday, October 9th, the *Misiones*, another of the Argentine armoured torpedo-boat destroyers, built by Messrs. Yarrow & Co., was taken out for its official trial at the mouth of the Thames. A three hours' full speed run was made, loaded with 35 tons, when a mean speed of 27·1 knots was realised, being 1·1 knots in excess of the contract speed of 26 knots. The Argentine Government was represented by Captain Diaz, Chief of the Commission, Mr. Hughes, Engineer to the Commission, and Lieutenant Barbara. Steam was supplied by six of Yarrow's patent water-tube boilers. The *Misiones* left Gravesend on November 28th for Buenos Aires. On Saturday, October 3rd, the *Corrientes*, another of the Argentine destroyers, was successfully launched from the Poplar works, with engines and boilers on board.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Nitocris.—On October 6th the *Nitocris*, a steel steamer, of about 2,715 tons, was launched at Middlesbrough for the Moss Steamship Co.

Hydrangea.—On October 9th a steel steam vessel of about 145 tons, was launched at North Shields for the Southern Steam Telegraph Co.

Ixia.—On October 9th a steel steam ketch of about 145 tons, was launched at North Shields, for the Southern Steam Telegraph Co.

Emily Charlotte.—On October 10th the *Emily Charlotte*, a steel steam tug, of about 122 tons, was launched at Newport (Mon.), for the Port Talbot Railway and Docks Co., Port Talbot.

Galatea.—On October 21st an iron steam ketch of about 150 tons gross, named the *Galatea*, was launched at Beverley, for the Great Grimsby and East Coast Steam Fishing Co., Limited, Grimsby.

Winnie.—On October 21st there was launched the steel screw steamer *Winnie*, by Messrs. Blumer & Co., at Sunderland, which has been built to the order of Messrs. Franz Rahtkens & Co., of Middlesbrough, and is of the following dimensions:—Length between perpendiculars, 304 ft.; breadth, extreme, 44 ft.; depth, moulded, 23 ft. 1 in.; and is designed to carry about 4,200 tons on a light draught. She is to be classed 100 A1 at Lloyd's. Her machinery is being constructed by Messrs. Blair & Co., Stockton. The cylinders are 23 in., 37½ in., and 61½ in. diameter, with a stroke of 39 in. The boilers are of steel, constructed to stand a working pressure of 160 lbs. per square inch. The vessel was christened by Miss Rahtkens, daughter of the owner.

Isa.—On October 22nd an iron steam ketch, named the *Isa*, was launched at Beverley, for the Societie Anonyme Pecheries a Vapeur, Ostend.

Brest Rock.—On October 22nd a steel steam schooner, of about 529 tons gross, named the *Brest Rock*, was launched at Workington, for A. Rowland & Co., Liverpool.

Oscar II.—On October 24th there was launched by Mr. James Laing, at Sunderland, a new type of steamer called *Oscar II.* It is stated that this type of steamer was invented by Mr. W. Hok, naval architect at the Deptford shipyard, Sunderland, in March, 1895, and that in September of the same year the name of "trunk deck" steamer was given to this type of vessel by the inventor. The first order for a trunk deck steamer was placed with Mr. Laing by Mr. Johnson, of Stockholm, on February 26th, 1896. For various reasons the launching of this vessel has been delayed till now, whereas originally the launching was to have taken place in August, or two months ago. The dimensions are as follows:—348 ft. long; 48 ft. broad; 23 ft. 9 in. moulded to main deck; 31 ft. 6 in. moulded to bridge deck at side; 32 ft. 6 in. moulded to bridge and trunk deck at centre; carrying capacity, 5,500 tons; bunkers, 400 tons; water ballast, 1,000 tons; cubic capacity in holds, 262,000 cubic feet; width of trunk, 22 ft.; tonnage not yet ascertained, but will be about 2,200 net register. The trunk is a continuous structure, which runs fore and aft on the weather deck, forming a girder and giving covered-in space for carrying cargoes. The trunk, it is explained, acts as a feeder for bulk cargoes such as grain, coal, oil, &c., and adds greatly to longitudinal strength. It is also stated that the *Oscar II.* is the first vessel built at Deptford yard in which extensive flanging of plates has been adopted, and that she is the first vessel not built by Messrs. Doxford to which is applied the method of joggling the plating.

James.—On October 26th there was launched from the yard of Mr. Joseph Scarr, Grovehill, Beverley, an iron lighter for Messrs. T. Walker & Co., 186, High Street, Hull, the general dimensions of which are—Length, extreme, 76 ft., by 20 ft. moulded beam, by 9 ft. moulded depth. Her carrying capacity is 250 tons. She was christened the *James* by Miss Scarr.

Trusty.—On October 31st there was launched at Thorne by Mr. R. Dunstan, to the order of Mr. W. J. Warrener, of Lincoln, for the Hull and Lincoln trade, an English oak keel, named the *Trusty*.

Chamois. On November 3rd H.M.S. *Chamois* was launched from the Howdon Yard of the Palmer Shipbuilding and Iron Co., Limited. She is to steam 30 knots, the I.H.P. being about 6,500, and is the fourth of eight torpedo-boat destroyers to steam 30 knots, now building by the Jarrow firm for the British Government.

Chester and Derby.—On November 3rd the *Chester* and *Derby*, iron steam ketches of about 143 tons gross, were launched at Newcastle for Messrs. Hagerup, Doughty & Co., Grimsby.

Leonidas.—On November 4th Messrs. Short Brothers launched from their shipbuilding yard at Pallion, Sunderland, a finely-modelled steel screw-steamer, built to the order of Mr. A. Embiricos, of Ibrail and Cardiff:—Length, 320 ft.; breadth, 43 ft.; and 24 ft. 6 in. depth, moulded, with a deadweight carrying capacity of about 4,350 tons. The vessel has been constructed to Lloyd's highest class, under special survey, and is built on the poop frame principle, with one deck laid, the poop being fitted up for the accommodation of captain, &c., in polished hardwoods, tastefully arranged. There is a very long bridge amidships, under which are large and commodious berths for officers and engineers, with chart and wheelhouse on top. There are five powerful steam winches and large multitubular donkey boiler. The steam steering gear is fitted in the engine-room, with controlling rods to the wheelhouse on flying bridge. The vessel is also fitted throughout with the electric light. Every care has been taken in the arrangements for the quick loading and discharging of cargo. On leaving the ways the vessel was named *Leonidas*, the ceremony being gracefully performed by Miss Esplen, of Liverpool. The vessel is to be fitted with triple-expansion engines by Messrs. John Dickinson & Sons, Limited, of Sunderland, having cylinders 22 in., 36½ in., and 62 in.; with a stroke of 42 in., steam being supplied by a large steel boiler, fitted with Howden's system of forced draught. During construction the vessel and engines have been under the supervision of Messrs. Wm. Esplen & Sons, of Liverpool.

Keelung.—On November 4th the steamer *Keelung* was launched by Messrs. Jos. L. Thompson & Sons, Limited, of the North Sands Shipbuilding Yard, Sunderland, built to the order of Osaka Shosen Kabushiki Kaisha, of Osaka, Japan. She is the first Japanese vessel built direct to the order of a Japanese firm by Messrs. Thompson. She is 262 ft. long, by 35 ft. beam, by 23 ft. depth, moulded, and is built on the spar deck rules to Lloyd's 100 A1 class, under special survey. The vessel has a poop containing spacious accommodation for 24 second-class passengers. The bridge amidships is fitted for the accommodation of first-class passengers at the forward end, with a large saloon in the centre. At the after end of the bridge, accommodation is fitted for the officers, engineers, messroom, scullery, bathroom, &c. On the top of the bridge at the forward end is fitted a large charthouse and captain's room. The forecastle is fitted up for the accommodation of the seamen, firemen, and petty officers. The main deck is laid throughout, and the forward 'tween decks are fitted for the accommodation of steerage passengers. Steam steering gear is fitted at the after end of the bridge with the controlling gear from the captain's bridge. Powerful screw gear is fitted on the poop aft; four powerful steam winches are provided for the handling of cargo. The vessel is smartly rigged in fore-and-aft schooner style. Four large lifeboats are provided amidships, and two smaller boats on the poop aft. Water ballast is arranged in the cellular double bottom right fore-and-aft, and in the fore-and-aft peaks. The engines and boilers are constructed by Messrs. John Dickinson & Sons, Limited, of the Palmer's Hill Works, Sunderland. the cylinders being 21½ in., 36 in., and 49 in. by 39 in. stroke, supplied with steam by two multitubular boilers constructed to work at 180 lbs. pressure. The vessel is built to meet the Board of Trade requirements for a passenger certificate, and is throughout constructed to meet the requirements for the special trade for which she is intended. The launch was most successful in every way, the christening ceremony being performed by Miss May Thompson, daughter of Mr. Robert Thompson, the managing director of Messrs. Joseph L. Thompson & Sons, Limited. The young lady also launched the vessel by means of hydraulic power. There was a large gathering of local ladies and gentlemen present, and the Osaka Co. was represented by Mr. Kohei Sugiyama, the managing director of the company; Mr. S. Konishi, the company's chief superintendent; Mr. Katsuki, of the company's engineering department: and also Mr. Kosaka and Mr. Watanabe. Captain Weller, of the Hamburg-Pacific-Dampschiffs Linie, Hamburg, was present, as were Mr. Cuthbert Hutchinson and others. After the launch the company adjourned to the firm's luncheon room, where the usual toasts were duly honoured.

Harpenden.—On November 5th Messrs. Austin & Son launched from the Wear Dockyard the steel screw steamer *Harpenden* to the order of Messrs. J. & C. Harrison, of London, Newcastle, Cardiff, &c. The vessel, which is built of steel to class 100 A1, under special survey in Lloyd's register, is estimated to carry 4 550 tons deadweight. She has been constructed on the three-deck rule with one deck laid. The machinery, which will be supplied by Messrs. G. Clark, Limited, will be of the triple-expansion type, with two steel boilers, working at a pressure of 160 lbs.

No. 130.—On November 5th there was launched by Messrs. J. Blumer & Co., at Sunderland, a steel screw steamer, whose principal dimensions are:—Length, b.p., 310 ft.; beam, extreme, 41 ft. 3 in.; depth, 25 ft. 1 in. The vessel is built to the spar-deck rule, and is designed to have a carrying capacity of about 4,500 tons. The engines are being constructed by Messrs. George Clark, Limited, Sunderland, having cylinders 22½ in., 37 in., and 61 in. diameter, with a stroke of 42 in. The boilers are of steel, and have a working pressure of 160 lbs. per square inch. On leaving the ways the vessel was named *No. 130.*

Norman.—On November 5th there was launched from the yard of the Sunderland Shipbuilding Co., Limited, to the order of W. Hawthorn, Esq., of Cowes, I.W., a steel screw steamer 206 ft. between perpendiculars by 29 ft. breadth, by 13 ft. 2 in. depth, classed 100 A1 at Lloyd's under special survey, having raised quarterdeck, bridge and topgallant forecastle. The officers' and engineers' messroom and accommodation is placed amidships, whilst the captain is berthed in house on deck. The vessel is provided with steam winches by Mr. R. Welford, of Pallion, and has large hatches to suit the trade for which the boat is intended. Steering gears by Messrs. Donkin & Nichol, patent windlass by Messrs. Emerson, Walker & Thompson Bros., Limited, tri-compound engines by Messrs. The North Eastern Marine Engineering Co., Limited, Sunderland, having cylinders 17 in., 28 in., 46 in. by 30 in. stroke, 160 lbs. working pressure, which include all the latest improvements in marine engineering. The vessel is built upon very fine lines for a steamer of this type, and will carry on 12¼ ft. draught of water 880 tons deadweight, on the exceedingly low net register tonnage of about 210 tons. Her speed loaded will be 11 knots average. Several vessels of this class have been built by this company, all carrying a very large cargo upon a similarly small net tonnage. During construction both hull and machinery have been inspected by Mr. Reed on behalf of the owner, and upon leaving the ways she was gracefully named *Norman* by Mrs. Hawthorn, wife of the owner.

Laristan.—On Thursday, November 5th, Messrs. Wm. Gray & Co., Limited, launched the fine steel screw steamer *Laristan*, to the order of Messrs. Frank C. Strick & Co., Limited, of Swansea and London. The vessel will take Lloyd's highest class, and her dimensions are:—Length, over all, 300 ft.; breadth, 42 ft.; and depth, 21 ft. 9 in. The deck erections consist of a full poop, bridge over machinery space, and topgallant forecastle. A handsome saloon and cabins for officers, &c., are fitted up aft, the engineers' rooms are in the bridge, and the crew's accommodation forward. The hull is built on the web-frame system, with a cellular double bottom, large aft peak tanks, large hatchways, five steam winches, steam steering-gear amidships, hand screw gear aft, large donkey boiler, patent direct steam windlass, boats on beams overhead, shifting boards throughout, stockless anchors, two masts with schooner-rig, and a complete outfit for a first-class cargo vessel. The Central Marine Engine Works of Messrs. William Gray & Co., Limited, supply fine triple-expansion engines of 1,000 H.P., having cylinders 21¼ in., 35 in., and 58 in., with a 39 in. piston stroke, and two large steel boilers to work at 160 lbs. pressure per square inch. The vessel and machinery have been built under the superintendence of Mr. Archibald Walker and Captain Rosser on behalf of the owners, and the ceremony of christening the steamer *Laristan* was gracefully performed by Miss Robinson, Wetherby House, West Hartlepool.

Apollo.—On Thursday, November 5th, Messrs. Furness, Withy & Co., Limited, launched from their Middleton shipyard at Hartlepool, a large steel screw steamer, built to the order of J. Lockie, Esq., Newcastle-on-Tyne. She is a fine type of a modern cargo boat, measuring over 350 ft. in length and built throughout of Siemens-Martin steel, with a large measurement and deadweight capacity, and built to the highest class at British Corporation. The vessel is of single deck type with poop, bridge and forecastle. The holds are fitted with iron grain divisions, and all decks, deck erections, skylights, bulworks, bulkheads, &c., are constructed of steel and iron. Cellular double bottom fitted all fore and aft for water ballast, the after peak being also available as a tank. The greater portion of the plates are in 24 ft. lengths, making the structure of the ship very strong. Five steam winches, donkey boiler, patent steam steering gear amidships, screw gear aft, direct steam patent windlass, stockless anchors, hauling into hawse pipes, and other modern appliances are fitted for the handy working of the vessel. The saloon and cabins providing accommodation for the captain, &c., are handsomely finished in polished hardwood. The steamer will be rigged as a two-masted fore-and-aft schooner, and has been constructed under the supervision of Mr. W. Stevenson on behalf of the owner. She will be fitted with triple-expansion engines of massive design with every provision for economical working by Messrs. T. Richardson & Sons, Limited, Hartlepool. On leaving the ways she was gracefully christened *Apollo* by Mrs. Liddal, Jesmond.

Leopoldville.—On November 6th Sir Raylton Dixon & Co launched from their Cleveland dockyards, Middlesbrough, the handsomely modelled mail and passenger steamer *Leopoldville*, built for the Compagnie Bilge Maritime du Congo for their traffic from Antwerp to the West Coast of Africa. The dimensions of the vessel are:—Length, 364 ft.; beam, 44 ft.; depth, moulded, 26 ft. Accommodation will be provided in most spacious and handsomely fitted cabins for 100 first-class and 60 second-class passengers, with large dining-room panelled in marble and inlaid woods in house on deck. The first-class smoking-room, second-class smoking-room and cabin entrances will be most elaborately fitted and decorated, and the vessel will be lighted throughout with the electric light. A powerful refrigerating machine with large cooling chamber will also be provided for the conveyance of fresh meat, provisions, etc. The speed of this vessel will be 13 knots an hour, and triple-expansion engines will be fitted by Messrs. Thomas Richardson & Sons, Limited, Hartlepool, having cylinders 27 in., 43 in., 72 in. by 48 in. stroke, supplied with steam by three large boilers fitted with Howden's forced draught, etc. On leaving the ways the vessel was gracefully named *Leopoldville* by Mrs. H. W. F. Bolckow. This is the third vessel built by Messrs. Dixon for the same service.

Oratava.—On November 7th Messrs. W. Dobson & Co. launched at Walker-on-Tyne a passenger and cargo steamer, which they have built to the order of the Mersey Steamship Co., Limited. The vessel is intended to run in their passenger and fruit trade between London, Madeira, and the Canary Islands. The dimensions are as follows:—Length between perpendiculars, 242 ft.; breadth, 35 ft.; and depth, moulded, 27 ft. She has been built under Lloyd's special survey for their highest class, and also fulfils all the requirements of the Board of Trade for their passenger certificate. The engines are being constructed by Messrs. John Dickinson & Sons, Limited, Sunderland, and are of the triple-expansion type, having cylinders 19½ in., 32½ in., and 54 in. diameter, by 39 in. stroke. Steam is supplied by one large multitubular boiler, working at 180 lbs. pressure. The hull and machinery have been built under the personal superintendence of Messrs. William Esplen & Son, of Liverpool, on behalf of the owners. The vessel was christened *Oratava.*

Milwaukee.—On Saturday afternoon, November 7th, an event of considerable importance in the shipping world as indicating the progress and tendency of naval architecture as regards cargo carrying steamers of the most advanced type, occurred in the launch from the yard of C. S. Swan & Hunter, Limited, Wallsend-on-Tyne, of the very large steamer built by them for Messrs. Elder, Dempster, & Co., of Liverpool, for their general cargo and cattle trade from America to European ports. This steamer, which is called the *Milwaukee*, has been specially designed and constructed for this trade. Her dimensions are: 484 ft. over-all, 470 ft. between perpendiculars, 56 ft. beam, and 42 ft. 3 in. depth, moulded to the awning deck. She is built to the highest class at Lloyd's on their three-deck rules, with scantlings in many instances considerably above the rule requirements so far as to stand heavy Atlantic weather. The upper deck is completely flush with the exception of steel houses amidships, in which the captain, officers, and engineers will be accommodated; and a steel steering house aft. The crew, including firemen, petty officers, as well as cattle-men, will be berthed forward in the topgallant forecastle. Amongst other purposes it is intended to convey cattle in the 'tween decks. These will therefore be fitted with a complete outfit of cattle stalls, water service, &c., as required. For rapidly handling the enormous cargoes which will be carried in the steamer a large number of hatches with twelve extra powerful steam winches, and side derricks with ample and powerful gear, will be supplied. The dead-weight cargo will be 11,500 tons, whilst the measurement cargo which can be carried will amount to over 18,000 tons, in addition to about 700 tons of permanent bunker capacity. The propelling machinery is being built by the North Eastern Marine Engineering Co., Limited, of Wallsend, and consists of a set of triple-expansion engines, with cylinders 28 in., 46 in., and 75 in. diameter, by 54-in stroke, with three large boilers supplied with steam at 180 lbs. pressure, and fitted with Howden's system of forced draught. Manganese bronze propeller blades, and See's ash ejector and other fuel and labour economisers will also be fitted in this steamer. The winches will be supplied by Messrs. John Lynn & Co., of Sunderland; the windlass and capstan by Clarke, Chapman & Co., Limited, and the steam steering gear by Messsrs. Davis & Co., of London. The vessel will also be fitted throughout with an installation of electric light, and with Campbell's patent self-adjusting accommodation ladders, &c. The launch was witnessed by a very large number of spectators. On leaving the ways the steamer was christened the *Milwaukee* by Mrs. Thomas Hudson Bainbridge, and immediately upon being released the huge vessel glided slowly and safely into the water, and was afterwards taken in charge by the tugs down to the North-Eastern Marine Engine Works, where she will receive her machinery. The company afterwards adjourning to the new drawing offices of the builders, where refreshments were served. It is expected that the *Milwaukee* will be delivered early in December. The builders have in hand a sister steamer to the *Milwaukee* to the order of Sir Christopher Furness.

Steel Lighter.—On November 11th there was launched from the yard of Mr. Joseph Scarr, Grovehill, Beverley, a steel lighter for Joseph Rank, Esq., Clarence Street, Hull. The dimensions of which are:—Length, over all, 66½ ft.; beam, extreme, 18 ft.; depth amidships, 9 ft. She is the first of four on order for Mr. Rank, and can carry 750 qrs. of wheat.

Gerd.—On November 12th Messrs. R. Craggs & Sons launched at Middlesbrough a vessel of the following dimensions:—183 ft. by 27 ft. by 14 ft. She is fitted by Messrs. Sir C. Furness, Westgarth & Co. with engines having cylinders of 13 in., 21 in., and 34 in., by 27-in. stroke, and will take the highest class in Det Norske Veritas.

Helena.—On November 14th Mr. H. Scarr launched at Beverley an iron lighter, having a carrying capacity of 135 tons, built to the order of Messrs. R. Grainger & Son, High Street, Hull. The vessel was named the *Helena*. Her dimensions are:—Length, 62½ ft.; beam, 15¼ ft.; depth, 7 ft. 9 in.

Saint Mary.—On Tuesday, November 17th, there was launched from the west yard of Messrs. C. S. Swan & Hunter, Limited, for a well-known Liverpool firm, a steel screw steamer, 312 ft. long by 42 ft. 6 in. beam, by 23 ft. 1½ in. moulded depth, built of the latest partial awning deck type, classed 100 A1 at Lloyd's, under special survey, to carry about 4,650 tons deadweight on a moderate draught of water. The vessel will be fitted with all modern appliances, including six steam winches and extra derricks for the rapid loading and discharging of cargoes. The engines of the vessel have been constructed by the North Eastern Marine Engineering Co., Limited, of Wallsend, and have cylinders 23 in., 38 in., and 61 in., by 42 in., with two large single-ended multitubular boilers, of 160 lbs. working pressure. As the vessel left the ways she was named *Saint Mary* by Mrs. W. Denton, of Newcastle-on-Tyne.

Dresden.—On November 17th Messrs. Earle's Shipbuilding and Engineering Co., Limited, launched the s.s. *Dresden*, built for the Great Eastern Railway Co.'s service between Harwich and the Hook of Holland. Her dimensions are—302 ft. long, 38 ft. beam, and 16 ft. 6 in. depth of hold, and she is built with a long partial awning deck and poop, and a raised forecastle, under the former of which are situated the first-class dining-saloon, ladies' room, state-rooms, lavatories, and the accommodation for officers, together with pantries, bar, galley, &c. On the lower decks and entirely forward of the machinery and boilers are the first-class state-rooms, with separate compartments for ladies where desired; and in a large deckhouse on the awning deck are the saloon entrance, state-rooms and captain's room, with a spacious trunk skylight for light and ventilation to the saloon. The total number of first-class passengers provided for is 226, and the whole of the fittings and equipment for these are of the most modern and complete description, every detail having been carefully considered which might add to the comfort of the passengers, and the arrangement is generally the same as in the s.s. *Vienna*, the last vessel placed on the Hook of Holland and Harwich service, including a handsome special state-room intended for the accommodation of distinguished passengers. An efficient system of fan ventilation is adopted so as to obtain a most ample supply of fresh air to the various spaces, and steam coil stores are provided for heating the vessel throughout. The second-class accommodation is also of a very comfortable kind, and situated in the poop and after 'tween decks for 120 passengers. The vessel will be schooner-rigged with two light pole masts, to which will be fitted Tate's patent derricks and gear for the rapid handling of cargo and baggage, in addition to three powerful steam winches. In the 'tween decks forward, provision is made for the carriage of horses. Water-ballast for trimming purposes is fitted, and the equipment of boats will be stowed on a boat deck overhead, which will afford rain shelter for passengers, besides forming a convenient promenade on top. There are two sets of triple-compound engines of high power, specially designed for this service, and steam is supplied by five large steel boilers. For use in calm weather and to ensure a good supply of air to the furnaces large fans are fitted in an airtight flat extending over the boiler space. The speed which the *Dresden* is expected to attain is 18 knots.

Cluden.—On November 17th there was launched from the shipbuilding yard of Messrs. John Readhead & Sons, West Docks, South Shields, a steel screw steamer of the following dimensions, viz.:—327 ft. over all, by 43 ft. by 24 ft. depth, moulded. The vessel has been built to the order of Messrs. Steel, Young, & Co., London. Her deadweight capacity is about 5,000 tons. Her engines, also constructed by Messrs. John Readhead & Sons, are of the triple-expansion type, having cylinders 24 in., 40 in., and 64 in. by 42-in. stroke, steam being supplied from two large steel boilers working at a pressure of 160 lbs. per square inch. As the vessel left the ways she was named the *Cluden* by Mrs. Sanderson, wife of the captain.

Yearby.—On November 19th Messrs. Ropner & Son launched at Stockton-on-Tees the second of their Trunk steamers built under the patent of Mr. R. Ropner, jun. She is a sister ship to the *Trunkby* (s.), recently completed by the builders, and is built off the single-decked rule with freeboard, having full poop, bridge, and topgallant forecastle, her deadweight carrying capacity being 4,100 tons on about 19 ft. draught. The following are her dimensions, viz.:—Length, between perpendiculars, 300 ft.; breadth, extreme, 45 ft.; and moulded depth, 22 ft. 2 in. The engines are by Messrs. Blair & Co., Limited, and have cylinders 20 in., 34 in., and 58 in., by 39 in. stroke, steam being supplied by two steel boilers, the working pressure being 210 lbs. The vessel was named *Yearby*.

Urania.—On Thursday afternoon, November 19th, Messrs. Craig, Taylor & Co. launched from their Thornaby shipbuilding yard, Thornaby-on-Tees, a handsomely modelled steel screw steamer of the following dimensions:—280 ft. by 41 ft. by 18 ft. 9 in., partial awning deck type, built on the web-frame principle, and to the highest class in Lloyd's. She is fitted with water ballast fore and aft, and also in the after peak. Her engines are being constructed by Messrs. Sir Christopher Furness, Westgarth & Co., Limited, Middlesbrough, the cylinders being 20 in., 32½ in., 53 in. by 36 in. stroke, with two large boilers to work at 160 lbs. pressure. She is constructed to carry 3,100 tons on a very light draught of water, and will be equipped with four large double powered steam winches and patent steam steering gear by Messrs. R. Roger & Co., large donkey boiler by Messrs. Riley Bros., patent direct steam windlass by Messrs. Emerson, Walker & Thompson Bros., Limited, Hastie's screw gear aft, and all modern improvements. The vessel has been built to the order of Messrs. Galbraith, Pembroke & Co., London, and as she left the ways she was gracefully christened the *Urania* by Mrs. A. H. Atkinson, of Egglescliffe, Yarm.

Gleaner.—On Thursday, November 19th, Sir Raylton Dixon & Co. launched from the Cleveland dockyards, Middlesbrough, an iron and steel steam trawler, of the following dimensions:—Length, 100 ft. 8 in.; beam, 20 ft. 5 in.; depth, moulded, 11 ft. 8 in. The vessel has been built to the order of Mr. W. H. Johnson, of Grimsby, and is of the well-known type of steam fishing vessels of which a large number have been built by Sir Raylton Dixon & Co. Triple-expansion engines will be fitted by the North-Eastern Marine Engineering Co., Limited, of Sunderland, the cylinders being 11 in., 17 in. and 30 in. by 21 in. stroke, with a large steel boiler working at 180 lbs. pressure. As the steamer was leaving the ways she was named *Gleaner.*

Neidenfels.—On Thursday, November 19th, a large steel teamer was launched by Messrs. Wigham Richardson & Co. from their Neptune Shipyard, Newcastle-on-Tyne, which they are building to the order of the Deutsche Dampfschiffahrts Gesellschaft "Hansa," of Bremen. The steamer is of steel, and is being built to take Lloyd's highest class. She is 430 ft. length, over all, 52½ ft. beam, and 31¼ ft. in depth, and will carry a deadweight cargo of 8,000 tons. She also will have very comfortable accommodation for a small number of passengers. She will be rigged as a schooner. The propelling machinery is of the most improved kind, and consists of a set of quadruple-expansion engines, self-balanced, on the Yarrow, Schlick & Tweedy system, supplied with steam from three large boilers fitted with forced draught. Both the machinery and boilers are being constructed by Messrs. Wigham Richardson & Co. The appliances for working both the ship and the cargo are of the most modern kind, and include steam windlass, steam steering gear, steam winches, steam cranes, electric light engine, etc. As the vessel left the ways she was named the *Neidenfels*, the ceremony being gracefully performed by Miss Goldson, of Tynemouth.

Devon.—On November 20th Messrs. R. & W. Hawthorn, Leslie & Co., Limited, launched a large steamer at Hebburn-on-Tyne. The vessel is of the following dimensions:—Length, 485 ft.: breadth, 54 ft.: and depth, 32 ft. She is classed at Lloyd's 100 A1, three-deck rule. The machinery consists of a set of triple-expansion engines, capable of indicating upwards of 3,000 I.H.P., with three large single-ended steel boilers, working at a pressure of 160 lbs. per square inch. These boilers are to be worked on Howden's system of forced draught. The vessel was named *Devon*. She has been built to the order of Messrs. William Milburn & Co., of London, for the Federal Steam Navigation Co., is for the Australian trade, and is to be specially fitted for carrying frozen meat with powerful duplicate refrigerating machinery.

Castello.—On November 21st there was launched from the yard of Messrs. William Doxford & Sons, Limited, Pallion, the turret-deck steamer *Castello*, which has been built to the order of Messrs. Thomas Wilson, Sons & Co., Limited, of Hull. She is 350 ft. by 46 ft., and carries 5,800 tons deadweight on about 21½ ft. draught of water, being specially designed for large capacity, and fitted with all the latest improvements in loading and discharging gear, with derricks carried on sideposts, as is now becoming usual on large steamers. This system was introduced by Messrs. Doxford in 1890, it then being fitted in two large steamers built for the British India Steam Navigation Co. The machinery of the *Castello* consists of tri-compound engines, having cylinders 24½ in., 40 in., and 66½ in. by 42 in. stroke, working at a pressure of 180 lbs., and boilers fitted with Howden's system of forced draught. She has been built under British Corporation special survey, and will receive their highest class. At the launch the owners were represented by Mr. C. Hassell, of Newcastle, and Mr. Wilkins, of Hull, the christening ceremony being performed by Miss Hassell, daughter of the owners' Newcastle representative. This launch brings the tonnage of the turret type up to 118,715, the *Castello* being the 28th vessel of this type now afloat. Messrs. Doxford's have now in course of construction turret steamers up to 7,000 tons deadweight, each with a speed of 18 knots, these larger vessels being specially built for the Eastern trades.

LAUNCHES—Scotch.

Star of Hope.—On October 24th a steel steam schooner of about 125 tons gross, named the *Star of Hope*, was launched at Aberdeen for Mr. G. Murray.

Rio Muaco.—On October 28th there was launched from the yard of Messrs. Murdoch & Murray, Port-Glasgow, a steel twin-screw steamer for service on the River Amazon. The vessel is fitted in a similar manner to the others built by this firm. The dimensions are:—Length, 140 ft.; breadth, 28 ft.; depth to awning deck, 15 ft. 4 in. The vessel is schooner-rigged, and all woodwork including decks, is of teak. On leaving the ways she was named *Rio Muaco*, and will be fitted with two sets of triple-expansion engines by Messrs. Lees, Anderson & Co., Glasgow.

The Victor.—On October 31st there was launched from the yard of Messrs. J. & J. Hay, Limited, Kirkintilloch, a steam lighter of 100 tons, built for their own canal and coasting trade. Her dimensions are—66 ft. by 16 ft. by 7 ft. She is to be fitted with engines and boilers at Messrs. Hays' works at Port-Dundas. On leaving the ways she was christened *The Victor* by Miss Maggie M'Call Dow, daughter of Mr. D. Dow, ironfounder.

Cardiff, Dover, and Eastbourne.—On November 2nd Messrs. Mackie & Thomson, Govan, launched at Govan the *Cardiff, Dover*, and *Eastbourne*, three fleeters, built to the order of Messrs. Hagerup, Doughty & Co., Grimsby. The trio, with the *Aberdeen* and *Bradford*, which are at present being fitted out in Cessnock Dock, are the first vessels of a large fleet of fishing steamers under construction for the owners. The general dimensions are:—103 ft. 9 in., between perpendiculars, by 20 ft. 6 in. extreme, by 11 ft. 7 in. moulded depth; gross tonnage about 160. The engines are of the triple-expansion type, with cylinders 10 in., 16 in., and 27 in. diameter, by 20 in. stroke. The boilers will work at a pressure of 180 lbs. The vessels are being fitted up with all the latest and most improved appliances for working the patent Otter gear. The engines, steam trawling, winch, &c., are being supplied by Messrs. Muir & Houston, Limited, and both hull and machinery are being constructed under the superintendence of Mr. H. F. Fourny, M.I.M.E., Bureau Veritas, surveyor to the port of Hull. The *Cardiff* was named by Mrs. John C. Pawson, the *Dover* by Miss Currie, and the *Eastbourne* by Mrs. John C. Rennie.

Ceres.—On November 3rd Messrs. Russell & Co., Port-Glasgow, launched a large steel spar-deck screw steamer to the order of Mr. John Lockie, Newcastle-on-Tyne. The dimensions are:—Length, 340 ft.; breadth, 46 ft.; depth, moulded, 28 ft. 6 in.; to carry 5,700 tons deadweight on 22 ft. 7½ in. draught, having engines by Messrs. John G. Kincaid & Co., of Greenock, cylinders 25 in., 41 in., 66 in. by 42 in. stroke; two single-ended boilers, 15 ft. 6 in. by 10 ft. 6 in., 160 lbs. pressure, and has all the latest and modern improvements for the rapid handling of cargo. On leaving the ways she was gracefully named the *Ceres* by Miss Cooper, of Hillhead, Glasgow.

Cornwall.—On November 4th there was launched complete from the shipbuilding yard of Messrs. Wm. Simons & Co., Limited, Renfrew, a powerful twin-screw hopper dredger, constructed to the order of Messrs. W. Hill & Co., for dredging operations at Devonport. The vessel is of the following dimensions:—Length, 200 ft.; breadth, 37 ft.; depth, 15 ft. 6 in. The gearing is specially adapted for the removal of rock, and the buckets work to a depth of 46 ft. below water level. She is propelled by two pairs of compound surface-condensing engines, capable of driving her at a speed of 8 knots per hour. The vessel is fitted with electric light to work night and day. On leaving the ways she was gracefully named *Cornwall* by Miss Anna Davidson, 7, Bellevue Crescent, Edinburgh.

Dunolly Castle.—On November 4th Messrs. Barclay, Curle & Co., Limited, Whiteinch, launched the *Dunolly Castle*, a screw steamer of 4,200 tons gross, built to the order of the Castle Mail Packets Co. The vessel, which is classed 100 A1 at Lloyd's, has been specially designed to carry a large cargo at a moderate draught and will be able to enter all the important harbours of South Africa. Her dimensions are:—Length, 382 ft.; breadth, 46 ft. 3 in; depth, 30 ft. The propelling machinery is of the triple-expansion type, and will enable the vessel to steam between England and the Cape in 22 days. There are three boilers, and the cylinders of the engines are

26½ in., 44 in., and 70 in. diameter by 4 ft. stroke. On the bridge deck is cabin accommodation for about 30 passengers, for whose use is provided a charmingly furnished saloon, panelled in oak and rosewood. For emigrants and third-class passengers there is also extensive accommodation, and the cabins devoted to the class may be subdivided to suit married people and families. The arrangement for the ventilation of the ship are excellent, and there is a continuous water service from end to end of the vessel. The derricks are all fitted with Messrs. William Reid & Co.'s self-oiling sheaves. All the sanitary recommendations of the emigration authorities have been carried out, and there is a complete installation of electric light on board. Mrs. Molteno performed the launching ceremony. Afterwards the builders entertained the launch party at luncheon. Mr. Archibald Gilchrist presided, and Sir Andrew Maclean, gave "Success to the *Dunolly Castle* and to the Castle Mail Packets." He said it was a very long time indeed since shipowners and shipbuilders had been able to contemplate the launch of a vessel with so much equanimity and pleasure as they had the launch of the *Dunolly Castle*, because trade had been so long dull that whereas the request formerly was to delay the floating of vessels, now owners could not get them fast enough in their desire to take as much advantage as possible of the spurt in freights. It had been a long lane of bad trade for both, but it was a long lane in which there was no turn; he hoped we had at last seen the turning, and that a long period of good trade, good freights, and active shipbuilding was in store. Good trade, good freights, and plenty of ships to build meant that the trade of the country was in a prosperous state, and the reverse affected every industry in the kingdom. He hoped the *Dunolly Castle* would prove a success. Just now there was a feverish anxiety to get ships and to get them quickly, but under the able guidance of Sir Donald Currie the Castle Line had seldom been in that position. The trade of South Africa had been a gradually expanding trade, and Sir Donald had taken care to keep ahead of its necessities by providing ships in dull times to meet what was required in busier seasons. The *Dunolly Castle* was not so large as that which Fairfield would launch on the following day, but he hoped she would prove as profitable an investment to the owners as those vessels which were intended more particularly for passengers.

Sir Donald Currie replied. He said there had been a marked advance of late in the type of ships and the methods of construction, and the efforts of owners to meet the wants of the growing overseas trades were very much greater. The *Walmer Castle*, launched18 years ago, had been a wonderful ship in her day, and represented great progress in shipbuilding; and the *Grantully Castle*, launched during a time of great difficulty to riverside employers of labour, had represented another important stage; but who saw these achievements little expected to see those vessels set aside by the modern ships which were necessary to meet the demand of the travelling public for greater comfort, accommodation, and speed. In their South African service they had now three types of ships—the type of the *Dunvegan Castle*, the type of the *Avondale Castle*, and the type of the *Dunolly Castle*—supplying three wants—luxurious travelling for those who couldafford it, capacity for cargo for shippers, and the travelling facilities desired by those who sought to exercise their powers abroad as labouring men The prevailing desire, as Sir Andrew Maclean had said, was for ships quickly. When he contracted for the *Dunolly Castle* he thought of that, and had an idea when he placed the half a million pounds worth of work that there would be a rise in value, but the vessels, one of which they had seen launched, had not been desired quickly on account of any prospective spurt, but because the owners desired to have the ships floated at a time when those who graced the function should not be exposed to the severities of winter. Messrs. Barclay, Curle & Co. had done well in finishing the vessel so quickly in spite of labour and other difficulties. They built good ships, and he was sure they would have larger success in the future. Other toasts followed.

Marie.—On November 5th the steam line fishing boat *Marie*, which has been built by the Dundee Shipbuilders' Co. for French owners, was launched at Dundee and towed to the Victoria Dock. The vessel herself has been built to the highest class, and the dimensions are:—Length, 49 ft.: breadth, 16 ft.: and depth, 9 ft. Messrs. Whyte & Cooper will fit up her engines and boiler. The former are of the surface-condensing class, with cylinders of 10 in. and 21 in. stroke.

Eugenie.—On November 5th Messrs. Hawthorns & Co., Limited, launched from their yard a steam yacht, built to the order of Mr. J. Gardner Cassatt, Philadelphia, and Paris. The vessel will be fitted by the builders with engines 11¼ in., 18 in. and 30 in., working at a pressure of 160 lbs. Her fittings will be of a luxurious kind, and she will have all the latest appliances for a vessel of her class. As she left the ways she was christened *Eugenie* by Mrs. Doctor Wilson, Edinburgh.

Avondale Castle.—On November 5th the Fairfield Shipbuilding and Engineering Co. launched the *Avondale Castle* which is the third steamship launched this year from the same yard for the Castle Mail Packets Co. She closely resembles the *Tintagel Castle*, which was launched in September last, and is now almost completed for sea. Her dimensions are 440 ft. in length, 50 ft. in breadth, and 33 ft. in depth, with a gross tonnage of about 5,600 tons, and is to the highest class in Lloyd's Registry under special survey, with additional subdivision into watertight compartments. She has a double bottom the full length and three decks, two of which are plated and protected with wood. Above the upper deck there is a very long bridge, a full poop and a topgallant forecastle, all the top decks being laid with teak. The cargo holds have a capacity for about 6,000 tons, the hatches having double steam winches and derricks fitted with self-oiling sheaves by Messrs. William Reid & Co., with steel wire gear. The main hatch is especially large for the shipment of boilers and mining machinery. Four steel masts support the cargo gear and provide for an ample spread of canvas, steel yards and squaresails being carried on the foremast. Cabin accommodation for about 170 passengers is provided in the middle of the vessel under the bridge. There will be a large number of sleeping-rooms for two persons, and all the cabins will be lofty and airy. The first-class dining saloon is at the fore end, and is entered from the promenade deck companion-house. Over the saloon is the ladies' boudoir, with a bevelled glass casement opening into the domed well of the saloon. Behind the companion there is a smoking-room, which is particularly lofty and well ventilated. At the after-end of the bridge there is a second-class dining saloon with a double entrance. It will be fitted with revolving chairs, and will seat about 70 persons. There are a number of sleeping rooms situated on the promenade deck overhead, and behind these, and entered from the after end, is a comfortable second-class smoking-room. In the poop and after 'tween decks the third-class passengers have large dining-rooms and sleeping cabins of various sizes, subdivision and privacy being specially aimed at. Each cabin will have toilet fittings and electric light, and the beds will be fitted with spring mattresses. The sanitary quarters are well-ventilated and the ship is liberally supplied with baths. The water service is most efficient and continuous, being supplied from large reservoir tanks carried high up above the baths. There is ample deck-room for recreation for a very large number of persons, the equipment throughout the ship being that of a first-class ocean passenger steamship. The machinery is triple-expansion, with three cylinders and three cranks working at a high pressure from four tubular steel boilers. The shafting is of forged ingot steel, and the propeller is of bronze. All are on modern principles, to obtain thorough efficiency and economy with little vibration. The power developed will ensure a regular speed to South Africa of about 13 knots per hour. The launch took place at twenty minutes past twelve, Lady Tennant, wife of Sir David Tennant, performing the christening ceremony. Afterwards the builders entertained the launch party at luncheon. Sir William G. Pearce presided. The chairman said he desired to alter the usual order of things by proposing in addition to success to the *Avondale Castle*, the health of the lady who had come all the way from London to launch the vessel. The *Avondale Castle* was the eleventh ship the Fairfield Co. had built for the Castle Mail Packets. The company had earned for itself world-wide fame, and he believed that it owed its great success very largely to the foresight of Sir Donald Currie. At the time when many had fears for the future of South Africa and for the prosperity of the colony's trade, Sir Donald had none, and, looking to needs ahead, ordered the steamers which were now building, and which, looking to the price they had been fixed at, could not fail to be employed to the great material advantage of the company. Whether the happy state of matters which prevailed would continue he could not say, but he sincerely trusted that the *Avondale Castle* would prove as remunerative an investment as the ships that had gone before. The motto of Sir Donald Currie and the Castle Line had been continuity. The progress of the line had been steady, there had been no leaps in the dark, and the policy which that represented meant profit. Sir David Tennant returned thanks for his wife, and alluded to the commercial prospects of South Africa, and the steady progress it had made and was making in spite of its much-talked-of troubles. He dwelt on the progress of the railway towards Buluwayo, and asserted that its completion would have a great effect on the cargo trade to the Cape, and that it would assure to the Castle Co. a continuous supply of emigrants to the colony. Sir William Arrol proposed the "Castle Co. and Sir Donald Currie." He spoke of the identity of the Castle Co. with Sir Donald Currie, and pointed out how its success depended on that gentleman's personality. Sir Donald Currie, in reply, observed that he might be said to be building ships by the yard. But, he continued, if he had been building ships it was on speculation based on his belief on Africa's progress. Alluding to the labour troubles, he pointed out how the difficulties to-day were as much between the men themselves as between the men and their employers. But he believed that the solution of all those difficulties was a simple one, and again asserted that it was to be found in conciliation. Referring to the latest mail steamers built for his line by the Fairfield yard, he said that the construction and management of those vessels was so good, and they were so equally designed and worked, that the first passages of the *Dunvegan Castle* and of the *Tantallon Castle* were within twenty minutes of each other. Other toasts followed.

Tetuan.—On November 5th there was launched from the yard of Messrs. John Scott & Co., Kinghorn, the steel screw steamer *Tetuan*, built to the order of the Mersey Steamship Co. (Messrs. Leach, Harrison & Forwood, managers). The dimensions are:—235 ft. by 33 ft. by 25 ft. to awning deck. The vessel has been constructed under the supervision of Messrs. Wm. Esplen & Son, of Liverpool, and is classed in the British Corporation's highest grade. The engines are of the newest type, with all the latest improvements. As the vessel left the ways she was christened by Miss Crawford, and immediately left for her trial trip.

Candia.—On November 7th Messrs. Caird & Co. launched at Greenock the large cargo twin-screw steamer *Candia* for the Peninsular and Oriental Steam Navigation Co. She is 450 ft. in length, 52 ft. in breadth, and 34 ft. 6 in. in depth, and of 6,100 tons gross. She will be supplied by the builders with triple-expansion engines of 4,500 H.P.

Beraudan.—On November 7th the Grangemouth Dockyard Co. launched from their shipbuilding yard at Grangemouth a steel screw steamer to carry petroleum in bulk. The dimensions of the vessel are 160 ft. by 24 ft. by 10 ft. 6 in. She has been built under Lloyd's special survey for their 100 A1 class and also to Dutch Government rules, and she is to carry 400 tons of petroleum in eight tanks. The vessel is fitted with powerful Worthington pumps, capable of loading and discharging the vessel in five or six hours, and the engines are being supplied by Messrs. Shanks, Morrice & Co., Pollokshaws. On leaving the ways the vessel was gracefully named *Beraudan* by Miss A. Grierson, Glasgow.

Connemara.—On November 7th Messrs. William Denny & Brothers, of the Leven Shipyard, Dumbarton, launched from that yard the steamer *Connemara*. The vessel is a twin-screw, and is intended for the London and North-Western Railway service from Holyhead to Greenore. In many respects she is similar to the *Rosstrevor*, already built by Messrs. Denny for the same service, and is intended to further develop the trade between these ports. She is 280 ft. long on the water line, 35 ft. moulded breadth, and 15 ft. moulded depth, to the main deck. She has very fine lines, one peculiarity being the manner in which the lines of the ship are carried right out to the back of the rudder. The shafts of the twin-screws are enclosed in webs, built out from the sides of the ship, the ends of the shafts being supported by a "spectacle frame." She has also large bilge keels to minimise rolling. Large accommodation is provided for both saloon and steerage passengers. The first-class saloon is situated on the main deck, forward of the boilers, and is nicely finished in hardwood. On the port side abaft the saloon there is a large ladies' room, and adjoining this there is a suite of state-rooms reserved for ladies. On the opposite side there is a range of state-rooms reserved for gentlemen. On the lower deck there is a large sleeping saloon, fitted all round with sofas. The third-class accommodation is situated aft on the main and lower decks. The officers and engineers are berthed on bridge deck, and above the dining-saloon there is a roomy companion, with a few special state-rooms. The vessel has two pole mast, and will be fitted with triple-expansion engines and high pressure boilers by Messrs. Denny & Co., engineers, Dumbarton. She is fitted throughout with electric light, and she has also a complete system of mechanical ventilation driven by electric fans. She has very large accommodation for carrying cattle, which is an important feature in the Greenore trade. The launching ceremony, which was in every way successful, was performed by Lady Stalbridge, wife of the chairman of the London and North-Western Railway, for which company the steamer has been built. Afterwards the company proceeded to the model hall in the yard, where luncheon was served, Mr. Walter Brock, the head of the firm, presiding.

Lily.—On November 7th Messrs. Blackwood & Gordon launched from their Castle Shipbuilding Yard, Port-Glasgow, the s.s. *Lily*, to the order of Messrs. The Glasgow, Dublin, and Londonderry Steam Packet Co., Limited (Messrs. Alexander A. Laird & Co.), Glasgow. The steamer is built of steel to Lloyd's highest class, and has dimensions—190 ft. by 29 ft. 3 in. by 14 ft. moulded, with a gross tonnage of 665 tons. She is fitted with passenger accommodation aft for 40 saloon passengers, also with steerage and deck accommodation, and is arranged for the carriage of cattle and cargo between this country and various Irish ports, and has water ballast fitted under the forward and aft holds sufficient to bring her to a suitable trim in any condition of loading. After the launch, which was successfully performed by Miss Maclay, daughter of Mr. David T. Maclay (of Maclay, Murray & Spens), secretary of the company, the steamer was brought to Messrs. Blackwood & Gordon's wet dock to receive her engines, 15 in., 24½ in., and 40 in. by 30 in. stroke, and suitable boiler by the same makers. The steamer is fitted with all modern appliances, including a complete installation of electric light. After the launch the company were entertained to luncheon in the builders' model-room. Mr. M'Geoch presided, and proposed "Success to the *Lily*." He hoped her career would be as smooth and pleasant as her passage down the ways that day. This was the second steamer that they had built for Messrs. A. Laird & Co. The previous steamer, *Daisy*, had given satisfaction, and he felt sure this one would do the same. He wished the steamer great success and continued prosperity to her owners in their trade between the Clyde and Irish ports. Mr. M'Connell replied, and in proposing "Success to Messrs. Blackwood & Gordon," said the *Daisy* had justified their expectations in every respect, and he had no doubt that the *Lily* would do the same. Other toasts followed.

Mayflower.—On November 7th there was launched from the shipbuilding yard of Messrs. James and George Thomson, Limited, Clydebank, a large twin-screw steam yacht named the *Mayflower*. She has been built to the order of Mr. Ogden Goelet, of New York, from designs by Mr. G. L. Watson, and is one of the largest pleasure yachts ever built for a private owner. Her principal dimensions are:—Length between perpendiculars, 275 ft.; over figurehead and taffrail, 320 ft.; breadth, moulded, 36 ft. 6 in.; and depth, 21 ft. Her gross tonnage is about 1,800 tons. The yacht will be lighted throughout by electricity, for which purpose there is a battery of accumulators, besides duplicate electrical machinery; two powerful search-lights will also be fitted. Refrigerating machinery on the Kilbourn system is also fitted, with large refrigerating chambers adjoining. The various cabins and state-rooms have a height and spaciousness not often found on board a vessel even of the largest size. The dining-saloon, drawing-room, library, boudoir, and staterooms will be luxuriously appointed; a portion of this work is being executed in Paris. The vessel will be rigged as a two-masted schooner. Her machinery is of the inverted triple-expansion type, with two double-ended return-tube boilers, which will give her a high rate of speed. The christening ceremony was gracefully performed by Mrs. R. R. Ure, Glasgow.

Topaz.—On November 7th Messrs. Scott & Sons launched from their shipbuilding yard at Bowling a screw steamer of the following dimensions, viz.—185 ft. by 29 ft. by 13 ft., built to the order of Mr. William Robertson, Glasgow. Triple-expansion engines will be fitted on board by Messrs. Muir & Houston, Limited, Kinning Park, Glasgow. On moving down the ways the steamer was named the *Topaz* by Miss Shaw, Gourock.

Duneric.—On November 9th the *Duneric*, a steel steamer of about 1,877 tons gross, was launched at Campbeltown, owned by Messrs. A. Weir & Co., Glasgow.

Auping.—On November 10th Messrs. Charles Connell & Co. launched on the Clyde a steel screw steamer, built to the order of Messrs. G. & J. Weir, Limited, Cathcart, for the China Merchants' Steam Navigation Co., Shanghai. Her dimensions are:—Length, between perpendiculars, 265 ft.; breadth, extreme, 40 ft.; depth, moulded, 22 ft. 6 in.; with a gross tonnage of about 1,750 tons. The vessel has been built to the British Corporation's highest class, and has two steel decks, the upper deck being sheathed with teak, while she has also a shade deck, which extends the whole length of houses and out to ship's side. Accommodation is provided in houses on upper and shade decks for captain, officers, engineers, and a large number of European and Chinese passengers, all being fitted up in a handsome and comfortable manner, the crew being berthed forward in 'tween decks. The engines, which are of the triple-expansion type, have cylinders 21 in., 33 in., and 55 in., by 36 in. stroke, steam being supplied by two single-ended boilers 14 ft. by 11 ft., suitable for a working pressure of 180 lbs., and they are being constructed by Messrs. David Rowan & Son, Glasgow. Both hull and machinery have been constructed under the personal supervision of Captain R. M. Andrew and Mr. James Ferrier, the company's representatives. The vessel was named *Auping* by Miss Weir, daughter of Mr. Thomas Weir, the company's marine superintendent, Shanghai.

Duns Law.—On November 16th Messrs. Russell & Co. launched from their shipbuilding yard at Port-Glasgow a finely modelled steel sailing ship of 1,500 tons register, and the following dimensions:—Length, 248 ft.; breadth, 37 ft. 6 in.; depth, 22 ft. 6 in. The new ship has been built to Lloyd's highest class to carry 2,750 tons cargo, and is owned by Messrs. Thomas Law & Co., Glasgow. She was named the *Duns Law* by Miss Marguerite Law, daughter of the owner, and will be under the command of Captain Greig, late of the *Elginshire*.

Fleetwood, Grimsby and Harwich.—On November 18th Messrs. Mackie & Thomson, Govan, launched three steam fleeters for Messrs. Hagerup, Doughty & Co., Grimsby, part of an order for 35 fleeters and three "carriers" which Messrs. Mackie & Thomson are executing for the same owners. Of the 35, eight have now been launched. The dimensions of each are—Length, 103 ft. 9 in.; breadth, 20 ft. 6 in.; and depth, 11 ft. 7 in. Triple-expansion engines, with cylinders 10 in., 6 in. and 27 in., diameter respectively, and a stroke of 20 in., are being supplied by Messrs. Muir & Houston, Kinning Park. The construction of the hulls and engines is being superintended by Mr. H. F. Fourny, M.I.M.E., and Bureau Surveyor for the port of Hull. The vessels were named *Fleetwood* by Miss Donald, the *Grimsby* by Mrs. Donald, and the *Harwich* by Mrs. Pawson, Partick.

Indian Empire.—On November 18th Messrs. John Reid & Co. launched, on the Clyde, the steel sailing barque *Indian Empire*, which they have built to the order of Messrs. George Duncan & Co., London. The vessel, which is of 3,000 tons carrying capacity, will be commanded by Captain David Watson.

Hawea.—On November 20th Messrs. Archibald M'Millan & Son, Limited, Dumbarton, launched the steel screw steamer *Hawea*, for the Union Steamship Co., of New Zealand. The dimensions of the vessel are 260 ft. by 36 ft. by 24 ft., and she has been built for the company's trade at New Zealand and Australia, and is intended for cargo purposes. The machinery will be supplied by Messrs. Denny & Co., Dumbarton. The vessel has been constructed to the highest class under the British Corporation rules.

Pisa.—On November 23rd Messrs Alex. Stephen & Sons launched from their works at Linthouse a handsomely modelled two-masted, schooner-rigged, steel screw steamer, built to the order of Messrs. Rob. M. Sloman & Co., Hamburg, for their trade betwen that port and New York. She has been constructed under British and Germanischer Lloyd's to their highest classes, and also conforms with the requirements of German laws for emigrant ships, and is of the following dimensions:—Length, between perpendiculars, 390 ft.; breadth, extreme, 46 ft.; depth, moulded, 30½ ft. The deck erections consist of full poop, bridge-house and topgallant forecastle. She has been constructed with a cellular double bottom for water ballast, has two complete steel decks, the upper being sheathed with yellow pine. The appliances for the working of both ship and cargo are of the most modern and approved description, including steam and hand-steering gear, steam windlass, steam winches, &c. Accommodation is provided under bridge deck at fore end for saloon, captain's room, spare state-rooms, while the officers and engineers are located at after end under bridge. All the apartments are fitted up in a substantial and comfortable manner. The vessel being intended for carrying emigrants, has been fitted with a complete arrangement of companion ways to 'tween decks, which also lead to large and commodious lavatories, &c., fitted up permanently under the poop and forecastle, while under the bridge deck suitable hospitals have been arranged to comply with the emigrant laws. The engines are of the most improved triple-expansion type, having cylinders 28 in., 47 in., and 79 in. diameter respectively, and a 51 in. stroke. Steam is supplied at 180 lbs. pressure by two extra large double-ended steel boilers, having six furnaces in each. The vessel is the eighteenth built by Messrs. Stephen for Messrs Sloman, and was named *Pisa* by Miss A. R. Stephen, 9, Princes Gardens. Messrs. Sloman were represented on the occasion by Mr. W. S. Von Essen, their superintendent engineer, who made graceful reference to the long and pleasant connection between the two firms.

LAUNCH—IRISH.

Arabia.—On November 21st Messrs. Harland & Wolff launched from the southern end of their yard the single-screw steamer *Arabia*, one of two sister ships for the Hamburg-American Steam Packet Co., the other, the *Arcadia*, being already launched. The new steamer is intended to run in the company's North Atlantic trade, has a gross tonnage of about 5,450 tons, and is built to the highest class of Germanischer Lloyd's. She will have accommodation for a few first-class and 300 steerage passengers, and be fitted with every mechanical facility for the rapid loading and discharging of cargo, as also with refrigerating machinery of the most approved kind, and a complete installation of the electric light. The propelling machinery for the vessel, which has been constructed in the engine works of the builders, consists of a set of quadruple-expansion engines, specially designed to avoid vibration, and similiar to those of the *Pennsylvania*, recently launched for the same owners. The owners were represented on the occasion by Inspector Van der Smissen and Captain Kopff.

TRIAL TRIPS.

Cumbria.—On October 24th the steamship *Cumbria*, built by the Ailsa Shipbuilding Co., Troon, for Messrs. R. Tedcastle & Co., Dublin, went on her official trials on the measured mile at Shelmorlie and an extended run down the Firth. The result was highly satisfactory, the speed of 13½ knots having been attained. The machinery, which is triple-expansion, by Messrs. Dunsmuir & Jackson, of Govan, worked with regularity and smoothness. She is fitted throughout with electric light and all modern appliances for the comfort of passengers, safe carrying of cattle, and rapid working of cargo. She has been built in excess of the highest class at Lloyd's, and under the inspection of Captain Walker, who, representing the owners at the trials, expressed himself as highly satisfied with the steamer in every respect.

Kirkfield.—On October 27th a satisfactory trial trip was made with the new steamer *Kirkfield*. She has been built by Messrs. Bartram & Sons, Sunderland, for Messrs. J. R. Cuthbertson & Co., of Glasgow, and is of the following dimensions:—Length, 344 ft.; breadth, 45 ft.; depth, 28 ft. 9 in. Gross tonnage, 3,602. She is classed 100 A1 at Lloyd's, and is of the spar-deck type, with poop, long bridge and topgallant forecastle. The engines and boilers have been made by Messrs. J. Dickinson & Sons, Limited. The vessel made several runs over the measured course, and attained a speed of 12 knots, which was considered very satisfactory.

British Trader.—On Thursday morning, October 29th, the s.s. *British Trader*, built by Palmer's Shipbuilding and Iron Co., Limited, to the order of the British Shipowners' Co., Limited, Liverpool, was taken to sea for her official steam trials. Her dimensions are as follows:—Length, between perpendiculars, 350 ft.; beam, moulded, 45 ft.; depth, 28 ft. 6 in. The vessel has been built under special survey to class 100A in Lloyd's Register, and is of the three-deck type. Two complete steel decks are laid extending all fore and aft. The poop is fitted for cargo, the officers and engineers being berthed on the bridge in a large steel deckhouse, and the crew in the forecastle. Water ballast is provided for aft in a cellular-bottom and in a deep hold tank amidships. All the necessary requirements to fit the vessel for general and grain cargoes are complied with, and all the most modern improvements for the safe handling of the vessel, and rapid loading and discharging of cargo are supplied and fitted throughout. The vessel is designed to load a deadweight of about 5,600 tons on 23 ft. The engines, which have also been built by the Palmer Co., are of the triple-expansion type, having cylinders 24 in., 40 in. and 64 in. by 45-in. stroke, and two large steel boilers, 15 ft. 6 in. by 10 ft. 6 in., working at a pressure of 180 lbs., and are fitted complete with Henderson's patent automatic self-cleaning furnaces. During her construction the vessel has been under the personal supervision of Mr. Grundy, superintending engineer for the owners. During the trial the engines worked in a highly satisfactory manner at 80 revolutions per minute, and a mean speed of $12\frac{1}{4}$ knots was attained on the measured mile, after which the vessel returned to the Tyne for her bunkers.

Princess.—On October 30th the new awning-decked steel screw steamer *Princess*, of Charlotte Town, Prince Edward Island, lately built by the Grangemouth Dockyard Co., Limited, Grangemouth, to plans and specifications by Messrs. MacNicoll & Co., Glasgow, and to Lloyd's highest class, with all necessary recent improvements, for the Charlotte Town Steam Navigation Co., Limited, for passenger and mail service in Canadian waters, went down the Forth on her official trial in cargo trim, with a select party on board. She is 165 ft. by 26 ft. by 18 ft. 3 in. to awning deck, with extensive and elegant passenger accommodation aft, hold and 'tween decks for cargo forward, with large gangway doors on each side to admit horses between main and awning decks if required. Teak houses above awning deck for steam-steering gear, captain, chief officer, purser, mails, smoking-room, and deck saloon. She has been fitted with a powerful set of triple-expansion engines by Messrs. Muir & Houston, Glasgow, the cylinders being 16 in., 26 in., and 42 in. by 30 in. stroke, with large boiler for 160 lbs. working pressure, and in spite of a heavy sea, with half a gale of wind blowing, she attained a mean speed of $12\frac{3}{4}$ knots, and proved herself a very easily handled vessel and a first-rate sea-boat. The owners were represented by L. C. Owen, Esq. Captain Angus Brown, with a Canadian crew, will take her to Canada.

Furor.—On October 30th the torpedo-boat destroyer *Furor*, built by Messrs. James & George Thomson, Limited, Clydebank, for the Spanish Government, ran her trials on the Clyde. The mean speed on a three hours' run was 28·25 knots, or a quarter of a knot in excess of the guarantee. During the trial the *Furor* had the full load of 75 tons on board, which is considerably greater than the load carried by the destroyers of the British and other Governments. His Excellency Commodore Cámara, chief of the Spanish Royal Naval Commission in London, and a staff of assistants were on board, representing the Spanish Government.

Peru.—On October 30th the new steamer *Peru*, of 2,800 tons register, built by Messrs. Caird & Co., Greenock, for the Pacific Steam Navigation Co., underwent her official trial on the Clyde with satisfactory results. She is a sister ship to the *Chile*, which broke the record last month on her maiden voyage from Liverpool to Valparaiso.

Inyati.—On October 31st this steamer, the latest addition to Messrs. T. Rennie Son & Co.'s direct Natal Line, and built by Messrs. Hall, Russell & Co., of Aberdeen, was taken for her final trial at sea. She is 321 ft. long, 40 ft. beam, and 24 ft. 7 in. deep, with 2,550 gross registered tonnage. She is built of the spar deck type, having long bridge amidships, topgallant forecastle forward, and long deckhouse with shelter deck for passengers accommodation aft. She has double bottom, constructed on the cellular principle, and is fitted with water ballast tanks under the fore main and after holds. Her deck machinery throughout is of the latest pattern and arranged for quick handling of cargo and for dealing with heavy machinery. The steam-steering gear is connected direct to the rudder head and designed with a view to absence of noise, rattling of chains, or vibration of rods being entirely done away with. She is fitted up for a considerable number of first and second-class passengers, having saloons aft and amidships, with smoking and music saloons. Her passenger accommodation is of the most tasteful and comfortable description, there are large state-rooms in close proximity to the saloons, fitted out for family parties, also others suitable for two or four passengers. State-rooms are constructed amidships, on deck, and also under the spar-deck to suit all tastes, fitted with iron beds, spring mattresses, folding lavatories, electric lights, and also electric heaters, bells, and all other means for providing comfort for passengers of either sex at sea. Baths are fitted both amidships and aft with hot and cold water. Ice-house, hot press, stewards' stores are most conveniently arranged, and linen and drying-rooms, heated by steam, bakers', cooks' and stewards' accommodation has been amply provided. The first-class saloon extends the full width of the ship and is most tastefully decorated, three tables run along the room, capable of seating the whole of the passengers at the same time. The sides are panelled in polished marble, many different colours being used, and enriched with gilded ornaments; lounge seats, sideboards, bookcases and fireplace finished in different colours of marble, are arranged with well in the centre, giving a full height of about 18 ft. and direct light from the skylight, and the the effect at night when the electric light is used is most elegant. The navigation of the ship has been equally carefully considered. The captain's room and chart room are arranged immediately below the bridge. Two of Lord Kelvin's patent compasses are fitted, and also his sounding machine, in addition to the usual complement of compasses and other navigating appliances. The machinery has been constructed by the builders, triple-expansion engines, having cylinders $24\frac{1}{2}$ in., and $40\frac{1}{2}$ in., and 66 in., by 45 in. stroke, driving a solid bronze propeller, and supplied by steam from two large double-ended boilers, working at a pressure of 180 lbs. per square inch, are fitted. Auxiliary machinery for heating feed water, and water for baths, distilling water for the machinery, and also for baths, drinking or cooking purposes, filtering feed water and drinking water, pumping water at all pressures for sanitary and washing purposes, or in case of fire, and other detail machinery is also supplied, all being carefully thought out with a view to preventing chance of inconvenience or risk in case of failure to any one part. A powerful dynamo capable of performing its duty with ample margin and of illuminating the decks fore and aft, is fitted, together with many other details which the long experience of the owners has suggested. The trial at sea was eminently satisfactory, everything working with the most perfect smoothness and without the slightest hitch, and Mr. George Rennie, the senior partner in the firm, proceeded to London with the ship with a party of friends, attended by one of the partners of his firm of consulting engineers, Messrs. Flannery, Baggallay and Johnson, of London and Liverpool, the machinery being well tested on the run round, and being run at full speed throughout, indicating considerably more than 2,000 H.P.

Mayo.—On Tuesday morning, November 3rd, the s.s. *Mayo*, a turret steamer of Doxford's patent type, built by Messrs. C. S. Swan & Hunter, Limited, of Wallsend, for the Compania Bilbaina de Navegacion, of Bilbao, proceeded to sea for her trial trip. This vessel is 280 ft. B.P. by 38 ft. beam, and 21 ft. 9 in. to the harbour deck, and has been designed to carry a deadweight cargo of over 3,000 tons on 17 ft. 10 in. draught. The machinery consists of a set of triple-expansion engines, built by Messrs. Wm. Doxford & Sons, with cylinders 21 in., 35 in., and 57 in. by 39 in., with two large steel boilers working at 160 lbs. pressure. The deck machinery consists of four powerful steam winches, steam-steering gear, steam windlass, large horizontal multitubular donkey boiler, all carefully arranged for handling the vessel and cargo in the most expeditious manner. The compasses having been adjusted the steamer proceeded for a run out to sea, and in spite of the heavy weather succeeded in effecting a very creditable performance as regards speed and handiness. Among the gentlemen present were Captain Don Antonio Uribe, the superintending captain for the owners; Mr. Hopper, of Messrs. Wm. Dickinson & Co., Newcastle, the local agents for the Compania Bilbaina de Navegacion; Mr. Larrauri, the company's superintending engineer; the shipbuilders were represented by Mr. Rowland Hodge, and the engine builders by Mr. H. Harrison. After a satisfactory trial trip the steamer headed for Rotterdam, after which she will proceed to the Danube to load a cargo of grain.

Cornwall.—The hopper dredger *Cornwall*, which was launched on November 4th by Messrs. Wm. Simons & Co., Limited, Renfrew, proceeded down the river on Thursday, November 5th, and underwent dredging and steaming trials on Friday, November 6th, when, with a load of 700 tons dredgings in its hoppers, a mean speed of 8½ knots was obtained at the measured mile on the Gareloch. The *Cornwall* proceeded early the next week to Plymouth, where she was set to work on a rock removal contract for the Admiralty by the owners, Messrs. W. Hill & Co., London and Gosport.

Chiriqui.—On Tuesday, November 10th, the steamer *Chiriqui* went for a very successful trial trip on the Tyne. This vessel has been constructed by Messrs. Wigham Richardson & Co. at their Neptune Works, Newcastle-on-Tyne, for the West Coast service of the Pacific Steam Navigation Co., of Liverpool. The vessel is built of steel, 185 ft. in length by 31 ft. beam, and is rigged as a two-masted schooner. She has accommodation for 22 first-class passengers, the saloon and 11 state-rooms, &c., being all in deck-houses on the promenade deck, a most comfortable arrangement for a vessel trading in the tropics. Under the shade-deck, which extends almost from end to end, arrangements are made on the main deck and in the holds for carrying a large number of cattle. The engines and boilers, also constructed by Messrs. Wigham Richardson & Co., worked on the trial trip in a most satisfactory manner, driving the vessel at a mean speed of nearly 11 knots. The owners were represented on the trial trip by Captain Conlan, their marine superintendent, and Mr. James Thompson, their superintendent engineer, whilst the builders were represented by Mr. J. Denham Christie.

Trunkby.—On November 11th the new steamer *Trunkby*, the first of what are known as Ropner's patent "Trunk" vessels, was taken from Stockton to sea for her trial trip. The dimensions of the vessel are:—300 ft. by 45 ft. by 22 ft. 2 in. moulded, and she has the usual outfit of steam winches, steam windlass, steam and hand steering gear, &c. A numerous company was on board, including many local shipowners and leading experts, representing various branches of naval architecture, and the steamer's behaviour and appearance at sea was the subject of general admiration. In the design of this vessel there is an absence of the castellated appearance which is given to vessels having high deck erections such as full poop, bridge and forecastle with breaks between each, the navigating deck being continuous and unbroken all fore and aft. There is the same area of weather deck as is customary in ordinary vessels, and this, it is pointed out, is of importance when considered in connection with the carrying of deck cargoes. The trunk, it is claimed, adds materially not only to the strength of the ship, but to the comfort of the crew. In short, the builders assert that in this class of vessel there are all the advantages of the ordinary type, both in hull and decks, whilst at the same time the cargo capacity is largely increased. In the development of this type of vessel great attention has been given to the modes of access to the vital parts such as the accommodation and the engine-room, the companions and doors to such places being arranged to lead off from the high navigating deck. It is stated that should it be advantageous from an owner's point of view for a particular trade, or for other reasons, these vessels can be built so that the poop, bridge, and forecastle may not be the full width of the vessel, while still retaining all the advantages of the trunk. It is further claimed for this steamer that she has splendid measurement capacity, and also carries a very large deadweight caago on a very low net register tonnage. We are informed that her cubical capacity equals 133 ft. per net register ton, and that her deadweight capacity is about 300 tons more than one of the new and improved partial-awning-decked vessels of the same net register tonnage. The builders have orders for several similar steamers. Her engines are by Messrs. Blair & Co., Limited, and worked smoothly on the trial trip, giving an average speed of 12 knots, with 74 revolutions, and 10 knots with 62 revolutions. The following are among the advantages claimed for this type of steamer, viz.: "A good carrier of measurement and deadweight cargoes on a light draught, well adapted for carrying timber, stowing a winter deck cargo in the trunks, easily and cheaply converted into a cattle boat, no shifting of cargo, self-trimmer and feeder, clear holds without 'tween decks, working deck 7 ft. higher out of the water than an ordinary deck, ensuring more safety to hatches, has greater strength and stability and more buoyancy than steamers of the old type."

Virago.—On November 12th H.M.S. *Virago* went out on the Clyde on her full-power official coal-consumption trial in the presence of the Admiralty representatives. The results were entirely satisfactory, the speed for the six runs on the measured mile being 30·17, and for the three hours' continuous steaming was 30·07 knots. The coal consumption per I.H.P. for this high rate of speed worked out to less than the anticipated 2¼ lbs. per I.H.P. per hour, and the I.H.P. was somewhat over 6,000 for the three hours. Messrs. Welch & Ball represented the constructive branch at the Admiralty, Mr. A. R. Emdin the engineering branch. Mr. Lemon, resident engineer, overseer at Birkenhead, was also present, and the Devonport dockyard and Reserve were represented by Messrs. Gregory and Bath, and Mr. T. Pounds, the chief engineer of the vessel. Mr. R. Ratsey Bevis and Mr. J. W. P. Laird represented the contractors, Mr. William Laird being unavoidably prevented from attending at the last moment.

Varuna.—On November 12th the twin-screw yacht *Varuna*, which has been designed by Mr. G. L. Watson and built by Messrs. A. & J. Inglis, Pointhouse, for Mr. Eugene Higgins New York, went on a trial trip in the Firth of Clyde. On November 11th she had completed her progressive trials very satisfactorily, and there was little doubt that she would go through the severer test as easily. Her boats, which have been built by Mr. Peter M'Lean, Roseneath, were got on board, in the morning, and she left the Tail of the Bank shortly after ten o'clock. Two runs each way were made between the Cloch and the Cumbrae, and with everything working splendidly for a new boat of the class, a mean speed of just on 17 knots was the result. On November 13th she started on a 24-hours' coal consumption trial, and left during the following week for New York. The yacht will rank as one of the finest and most luxuriously fitted of the pleasure fleet at present under construction on the Clyde for America. The work is of the best, as everything is which comes from Pointhouse, and under the supervision of Mr. Watson nothing has been left undone to make the *Varuna* the ideal yacht her owner desires. She is fitted and furnished magnificently, and in her completed state will provide the shipbuilders of the United States with a lesson rather difficult to follow. Captain Trayler, of Wivenhoe, is in command, and amongst the crew of 16 there are several well-known racing hands from the Colne.

Ekuro.—On Friday, November 13th, the s.s. *Ekuro*, a fine little steamer built to the order of the British and Africa Steam Navigation Co., Limited, of Liverpool, by C. S. Swan & Hunter, Limited, Wallsend, was taken to sea for her trial trip prior to being handed over to her owners. This vessel, which has been built for the African coasting trade, is 185 ft. between perpendiculars, by 26 ft. 3 in. beam, by 12 ft. depth, moulded. She has a poop, in which is comfortable accommodation for a small number of first-class passengers; topgallant forecastle for the accommodation of the crew, with shelter decks amidships, and is in every way completely equipped for the trying trade in which she will be engaged. She will have a carrying capacity of somewhat over 600 tons deadweight. The machinery has been built and fitted on board by Messrs. J. P. Rennoldson & Sons, of South Shields, and consists of a pair of cylinders 23 in. and 40 in. diameter by 26 in. stroke, worked by a large steel boiler, the whole being specially adapted for hot climates. The owners were represented on the trial by Mr. John Steele, the company's marine superintendent, and Mr. Campbell, who locally superintended the construction of the vessel; the builders by Mr. E. W. De Rusett, and the engine builders by Mr. J. M. Rennoldson. The vessel was satisfactorily tried on the long run between Cullercoats Church and Newbiggin and back, when an average speed of 9½ knots was attained, the machinery and various appliances working in a most satisfactory manner. The vessel left for Liverpool immediately afterwards.

Ardova.—On Monday, November 16th, the official trial trip of the screw steamer *Ardova*, built at Blyth by Messrs. the Blyth Shipbuilding Co., Limited, for Messrs. E. F. & W. Roberts, of Liverpool, was run off the measured mile between Whitley and Hartley, and notwithstanding the heavy sea running the various trials of speed and other manœuvres through which the vessel was put were eminently satisfactory in every way. The *Ardova* is a highly finished modern cargo steamer 337 ft. by 47 ft. by 24 ft. 10 in. She has been designed to carry a large cargo on a small draught of water, and is fitted up both in the matter of machinery on deck for working the cargo and vessel, and also the accommodation for captain, officers and engineers, in the most complete and up-to-date manner. The engines have been built by Messrs. Blair & Co., of Stockton, and worked most successfully throughout. After the trial the *Ardova* returned to Blyth to bunker previous to sailing for

Dantzic to load her first cargo or New York. The completion of the hull of the vessel has been under the superintendence of Captain Mathias, and the machinery of Messrs. Irwin, Atkinson & Young.

Tintagel Castle.—On Tuesday, November 17th, the screw steamer *Tintagel Castle*, built by the Fairfield Shipbuilding and Engineering Co., Limited, for the Castle Mail Packets Co., and launched on September 12th, was put through her official trials in the Firth. The *Tintagel Castle* is intended as an intermediate steamer in the service to the Cape, and is a single screw steamer, classed 100 A1 at Lloyd's, 440 ft. in length, 50 ft. in breadth, and 33 ft. in depth, with a gross tonnage of about 5,600. She has a straight stem and elliptical stern, a capacious poop, a very long bridge, and a topgallant forecastle, and is rigged as a four-masted schooner, with yards on the foremast. The rake and spacing of the masts, in conjunction with an imposing funnel, present a particularly pleasing effect. Internally the vessel is divided into numerous watertight compartments, and there is a double bottom running the whole length, which again is subdivided into various compartments for carrying water ballast. The cargo holds are five in number, and have capacity for about 6,000 tons of cargo, and each hold has a separate hatch and double steam winches for quick despatch in loading and discharging. The main hatch is specially constructed to take in boilers and mining machinery of the largest dimensions, for lifting which a steel spar is provided, along with adequate gins and steel wire gear. The passenger accommodation is commodious and extremely comfortable. There are about 170 first and second-class berths, placed amidships, with dining saloons, drawing and smoking-rooms for each class. All these are in polished hardwood, artistically designed, and handsomely upholstered. Libraries and musical instruments have also been provided. A very large proportion of the sleeping-rooms are fitted for two persons only, subdivision and privacy being specially aimed at. A few family cabins for four are also provided. The third-class passengers have the poop and after 'tween decks entirely to themselves. These are suitably divided into cabins of various sizes. The dining-rooms are spacious and are upholstered throughout, and the sanitary quarters are liberally supplied with baths. The decks are very spacious, and there is ample room for recreation. The equipment of boats, &c., is of the highest class for a first-class passenger steamer. The engines are of the triple-expansion type, with three cylinders and three cranks working at a high pressure, steam being supplied by four tubular steel boilers. The shafting is of forged ingot steel, and the propeller of bronze. The whole designed on the most modern principles to obtain efficiency and work economically. It was stated at the time of launching that it was expected the power developed on trial would ensure a regular speed of about 13 knots per hour. As a matter of fact, on the trial, the vessel being in a light condition, a speed of 14⅜ knots was easily maintained, the machinery working with complete smoothness, and the boilers providing abundance of steam. The *Avondale Castle*, a sister ship, is at present being fitted out in the Fairfield Co.'s dock, and is expected to be completed about the end of the year.

Rijnstroom.—On November 18th the new steamer *Rijnstroom*, built by Messrs. Robert Thompson & Sons, Southwick Yard, Sunderland, for Messrs. the Holland Steamship Co., Amsterdam, left the river Wear for her official fully-loaded trial. Her dimensions are 237 ft. over all; breadth, 31 ft. 3 in.; depth, moulded, 15 ft.; and has been built to the highest class of Bureau Veritas, with quarterdeck, long bridge amidships, with accommodation for captain and officers, chartroom, &c., all fitted up in solid oak; also large and spacious rooms for engineers, the crew being berthed aft, and firemen in topgallant forecastle, cellular bottom and peaks for water ballast, three large hatchways with powerful steam winches and Derrick gear for rapid loading and discharging, steam steering gear and steam windlass, cargo and coaling doors in sides, steam heating to all berths. The electric light fitted throughout the vessel, including large lamps for working the cargo, has been supplied by Messrs. Hayward Tyler & Co., London. The engines are by Messrs. Geo. Clark, Limited, having cylinders 20 in., 33 in., 55 in., by 36 in. stroke, with very large boilers. After a series of runs in most unfavourable weather a mean speed of 13·7 knots was obtained, everything working most smoothly and to the entire satisfaction of the owners. During construction the ship and machinery has been superintended by Mr. Fenenga, of Amsterdam. Amongst those present were the director of the Holland Railway, Mr. Nierstrasr, and Mr. Fenenga, representing the owners, Mr. R. Charles Thompson representing the builders, and Mr. James Clark representing the engineers. Immediately after the trial trip the vessel left for Amsterdam, arriving there at 11 a.m. on Thursday, November 19th, averaging over 13 knots for the whole of the distance.

Unique.—On October 18th an important event, likely to mark a fresh era in shipbuilding, took place, when the s.s. *Unique* left the Wear on her trial trip. Considerable interest has been taken in this event, as the vessel is the first of a special design patented by Mr. John Priestman, of Southwick, Sunderland. Messrs. Roed McNair & Co., of Glasgow, for whom she has been built, have added very considerably to their reputation as shrewd business men, and evinced great enterprise in placing the order for the first vessel of this type, and there is no doubt the result will in every way amply justify their intrepidity. The dimensions of the vessel are:—Length, 280 ft.; breadth, extreme, 40 ft.; and depth, 20 ft. 3 in., with a deadweight carrying capacity of about 3,300 tons on a very light draught. The principal features of the vessel's design consist of a sloping or trimming deck, extending from the poop front to the forecastle with a raised platform deck affording the requisite space for cargo hatchways and flat for working the vessel. The space between the trimming and platform decks, may be utilised for carrying water ballast, which is a decided advantage over the ordinary type of steamer. Another very important feature regarding the sloping deck, is that timber can be carried on it, and large portable tee iron stanchions have been provided so as to enable the timber to be securely lashed. The special merits claimed for the new type may be briefly summarised as follows: reduction in nett tonnage, saving of trimming charges, optional extension of water ballast space, increased stability through special strengthening above the water line, and the patentee has succeeded in producing an excellent self-trimmer without detracting from, but rather adding to the graceful appearance of the vessel. The extra strength above water line is obtained by running a strong girder on top of the deck, from end to end of the vessel, the sides of the girders being connected to the vessel by strong double tee iron pillars, strains on the bottom are distributed over the whole section. This is the first ship built with this advantageous arrangement, and was patented in May, 1894. The trial was a complete success, the bold and fine appearance of the ship being much admired, and her behaviour at sea being fully up to the builder's expectations. Her engines are supplied by Messrs. The North-Eastern Engineering Co., Limited, Wallsend, with cylinders 21 in., 35 in., and 58 in. by 39 in. stroke, as well as two boilers, worked extremely well at 82 revolutions, and the vessel attained a mean speed of 12½ knots. Although a strong sea was running there was a total absence of vibration. The trial gave every satisfaction to all concerned, and the trip was much enjoyed by a large company, which included Messrs. Sigurd Roed and Geo. Hanserd McNair, of Glasgow, owners; Mr. John Priestman, builder; Messrs. Philipsen & Hunter, of North-Eastern Marine Engineering Co., Wallsend; A. McFarlane, of Sunderland, superintendent engineer to owners; Mr. G. W. Goddard, Grimsby; Messrs. P. H. L. McNair and Garvin Rankin, Glasgow; Mr. Hyulman Roed, Tonberg; Mr. Martin Cohn and Captain Egeness, who is in command. The vessel will sail for the Mediterranean on her first voyage.

Norman.—On November 21st the s.s. *Norman*, built by the Sunderland Shipbuilding Co., Limited, was taken to sea on her loaded trial trip, when the speed obtained upon a series of runs over the measured mile was a mean of over 11 knots per hour, the machinery working with perfect smoothness. Great satisfaction was expressed at the excellent results obtained. The steamer is 206 ft. between perpendiculars by 29 ft. broad by 13 ft. 2 in. in depth, classed 100 A1 at Lloyd's under special survey, having raised quarterdeck, bridge, and topgallant forecastle. The officers and engineers messroom and accommodation is placed amidships, whilst the captain is berthed in house on deck. The vessel is provided with steam winches by Mr. R. Welford, of Pallion, and has large hatches to suit the trade for which the boat is intended; steam steering gear by Messrs. Donkin & Co., patent windlass by Messrs. Emerson, Walker & Thompson, Bros., Ltd.; tri-compound engines by Messrs. The North Eastern Marine Engineering Co., Limited, Sunderland, having cylinders 17 in., 28 in., and 46 in. by 30 in. stroke, 175 lbs. working pressure; feed-heater, evaporator, and all the latest improvements in marine engineering. A complete installation of electric light is fitted by Messrs. Binko & Co., of London. The vessel is built upon very fine lines for a steamer of this type, and upon a net register of 223 tons carries 880 tons deadweight, and draws 12½ ft. when fully loaded. Several vessels of this class have been built by this company, all carrying a very large cargo upon a similarly small net tonnage. During construction both hull and machinery have been inspected by Mr. Reed on behalf of the owner, Mr. E. Hawthorn, of London.

Italy.—Lately the new steam trawler *Italy*, the latest addition to the Grimsby fleet, has been out on her trial trip. She was built by Messrs. Cochrane & Cooper, of Beverley, to the order of the International Steam Trawling Co., Limited, of Grimsby, and the machinery is supplied by Messrs. C. D. Holmes & Co., of Hull. She is fitted with engines of 40 N.H.P., with a large steel boiler. The trial proved in every way satisfactory, the engines working without a hitch.

Reviews.

Aspin's Iron and Steel Trades' Calculator. Fifth edition. London: James Aspin & Co.

THIS volume contains a number of useful tables. The greater number of pages in the book are occupied by tables giving values at prices from ¼d. per lb. to 60s. per cwt. for weights ranging from 1 lb. to 20 tons. Tables for the conversion of "long" into "short" tons, *i.e.*, of tons of 2,240 lbs. into tons of 2,000 lbs. (the measure prevailing in America) and *vice-versa*, are also given. In an appendix are found tables as to the weights of various superficial areas of different kinds of iron at certain thicknesses. Tables regarding the weight of brass, lead and copper and of steel, of head and nuts and of pipes follow, and there is also some useful information as to the strength of materials. From the summary of contents which we have given it will be seen that the work is chiefly intended for the aid of those who are engaged in the financial part of the engineer's and ironworker's business. To these it will be most valuable, for it will assuredly save much drudgery and not a little of that time which is money. As none of us are able to ignore finance it may well be that every office will find this a very useful book of reference.

The Civilization of our Day: A series of original essays by expert writers. Edited by James Samuelson. London: Sampson Low, Marston & Co. 1896.

THIS is a most interesting collection of essays, for they are written in an easy style and deal with the economic, social and mechanical problems which are so much considered and discussed at the close of the present century. Many of the essays, though in themselves intensely interesting, are quite outside the purview of the marine engineer. Amongst these we may instance such as those on educational and religious subjects, including that on the Power of the Press. Much as we are tempted to do so we can hardly discuss the subject of war and international arbitration in these columns. But there are several discussions on subjects with which our interests are largely identified. Amongst these we may instance that on posts, telegraphs and telephones and their relations to trade. This is by Mr. Baines, well-known for his work on the Post Office, and in what is peculiarly our own department, the editor's essay on "Locomotion by Land and Sea." Here is followed out the oft told tale of the development of steam navigation, especially upon the fiercely contested North Atlantic. This article is illustrated by profiles of the *Comet* of 1812, and the Cunarder's *Persia* of 1856, and the *Campania* of 1893, as well as the historical *Great Western* and the P. & O. *Rome*, as she appeared when she came out in 1881, and vessels of quite other types, such as a naval cruiser and a steam lifeboat. Some interiors, showing the luxury of modern saloon passenger accommodation are also illustrated, and it is evident that Mr. Samuelson has thoroughly studied his subject as presented in books. Yet we trace a want of what we may term contemporary familiarity with the matter from the fact that he speaks of the "Anchor Line with its beautiful *Cities of Rome* and *Paris*." The fact that the *City of Paris* has never been under the Anchor flag, and that circumstances which brought a *City* in the case of the *City of Rome* into the Anchor fleet, with its usual strict adherence to names terminating in "ia" would have been within the knowledge of most of those who follow the movements of the premier vessels of the Mercantile Marine.

Practically the same subject as that treated by Mr. Samuelson is covered in Mr. Baines' paper, when he deals with the packet service of the Post Office. The enormous development of the sea-borne mail and passenger services—alike in distance traversed, in speed obtained, and in quantities shifted, is very remarkable and clearly brought out. He remarks that in the thirties even the distance from Malta to Alexandria was unknown, and quotes an authority which says, "It is 480 miles from Malta to Alexandria in Egypt, and two days twelve hours passage by sea." In correction of this he states, that "the true distance is 819 nautical miles, and even now is nearer four than two and a half days." Here, we think, the speed of the eastward bound mail boat gets a very poor compliment. A *Lucania* would do not only 819 but nearly 1,400 miles in two days and a half on the Atlantic, and possibly more on the smooth and summer seas of the Mediterranean Sea, and a very simple calculation will show that 819 miles in two and a half days is something like 14 knots. Surely the P. & O. mails attain this speed!

Though we have pointed out these one or two little matters, we must not be taken to infer that on the whole the book is not as historically accurate as it is certainly interesting, suggestive and instructive, and its perusal will certainly repay our readers.

Lean's Navy List. London: Witherby & Co., 1896.

WE have received the issue of this invaluable publication for the last quarter of the current year. Each issue is more valuable as a work of reference than its predecessor. The present volume has new war services, and additional special matter in reference to twenty-five officers of the Royal Navy. The matter contained is brought thoroughly up to date, for, with the flysheet, we have promotions and appointments down to the 25th September.

Der Heere Flotten der Gegenwart. Vol. I. Berlin: Schall & Gund, 1896.

THIS volume is the first of a series of works dealing with the Armies and Navies of the world. As it is a German work it is only natural and proper that the first forces dealt with should be those of the Fatherland. Accordingly we find this volume treating of the German Army and Navy. The first part of the work, dealing with the land forces, is written by General H. von Boguslawski, and the second, which more peculiarly interests us and our readers, is by Rear-Admiral Aschenborn. The treatment of their respective subjects is thoroughly German in its exhaustiveness. The whole military system of the country is thoroughly explained and elucidated, whilst the establishment of the various arms is set forth. Every detail connected with the rigid German etiquette seems to be gone into. We not only find accounts of the German soldiers weapons, but also of his drums, his buttons and chevrettes, and his officers' cockades are all dealt with and even illustrated. Perhaps what is most striking in this part of the volume is the thoroughness of the arrangements for transport and for commissariat in the field.

But the second part of the volume is that to which we must devote our chief attention. It begins with an historical retrospect and we see of how recent growth the German Navy is. It would seem that the union of the Empire created it, for the old Prussian Navy and other early fleets were inconsiderable enough. At all events they had to take the part of discretion, to a large extent at least, during the struggle of a quarter of a century ago. The Admiral deals with the establishment of the Navy and with the question of personnel and equipment of the officers and men, and also to some extent with the material of the Navy. A good deal of attention is paid to the artillery of the fleet and the vessels themselves are described and illustrated. The whole Navy is given in a series of tables which show details as to the class, construction, dimensions, armament, armour and situation of the various ships which it comprises. Amongst others are tabulated the Auxiliary cruisers. These are no less than ten in number, half of them having a sea speed of twenty knots. Here we again see that the idea which the British Admiralty developed is appreciated abroad, and that in proportion to our Navy and Mercantile Marine we are woefully deficient in fast merchantmen, thanks to the difference between our policy and that of our less short-sighted neighbours. There is, of course, a good deal of information in the volume which appeals to the general reader more than to the specialist, for a series such as the present must look for support to a wide circle, yet at the same time there is much detail which is not readily accessible, even if it be accessible at all, to the English reader elsewhere. The volume ought certainly to form a part of the library of every one who is interested in modern naval development. We cannot leave the work without a word of praise to the illustrations, many of them in colours, which are liberally interspersed in its pages. Some of them are most effective, especially those of the full-rigged ship *Gneisenau* and of the despatch boat *Wacht*.

Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—Ed. M. E.]

THE NORTH GERMAN LLOYD CO.

To the Editor of The Marine Engineer.

Dear Sir,—In your issue of September 1st, page 246, you say that Captain Willigerod, of the North German Lloyd, was made a "Knight of the Red Eagle." I am given to understand by a German that this is not true, the order not being of such a high degree. My friend also concludes the contradiction with the remark, "Another lie," so you can form an opinion of how our papers are estimated from his point of view (a very narrow-minded one). You will greatly favour me by publishing what the exact order was.

I remain, Sir,
Yours truly,
Nomo.

New York, October 11th, 1896.

[The exact order presented to Captain Willigerod by the German Emperor is the Royal Prussian Order of the Red Eagle of the fourth class, with the Crown.—Ed. M.E.]

"THE SEA SERVICE."

To the Editor of The Marine Engineer.

Dear Sir,—My son has served an apprenticeship to an eminent firm of marine engineers, of five years. He is now 6th engineer in a mail line. I look upon the service at sea simply as being necessary to obtain the Board of Trade certificate. I then intend he should follow the profession of marine engineer ashore. What further course of instruction would you suggest as best calculated to make him master of his calling?

Would you kindly give me the information in your next issue

I am,
Faithfully yours,
J. Molineux.

Hessle, East Yorks., November 20th, 1896.

[The time at sea necessary for a 2nd engineer's certificate of competency is twelve months, of which not less than six months must have been in the capacity not lower than 4th engineer. After obtaining the 2nd certificate a further period of twelve months is necessary to qualify for the 1st certificate. There is also an honorary certificate, called extra 1st class, which can be obtained any time after the 1st certificate. The sea service is a finishing off of the practical training of the engineer to become master of the profession; the individual should then study well applied mechanics, thermo dynamics, and the modern theory of heat. Of course this implies a good thorough grounding in mathematics, &c. Then the commercial side of engineering should be studied, namely, estimating, cost, &c. Also it is necessary that the individual should possess an elementary knowledge of naval architecture. He should have a good course, say, of three years, in a good engineer's office, to acquire drawing, &c.—Ed. M.E.]

NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from October 26th, to November 24th, 1896:—

Anderson, William J., chief engineer to the *Vernon*, additional for torpedo-boats, &c., to date November 19th.

Andrew, W. J., staff engineer, has been placed on the Retired List.

Andrews, Henry O., assistant engineer to the *Beagle*, to date November 19th.

Anstey, Henry C., assistant engineer to the *Polyphemus*, undated.

Baker, Alexander, engineer to the *Ramillies*, to date November 10th.

Baron, Roger, acting engineer to the *Nelson*, to date November 3rd.

Bills, William H. T., fleet engineer to the *Victory*, additional for the *Swiftsure*, to date November 3rd.

Bramsdon, William H., staff engineer to the *Ramillies*, undated.

Burner, William H., fleet engineer to the *Victory*, additional for the *Mercury*, to date November 16th.

Canning, Henry T., assistant engineer to the *Polyphemus* undated.

Chater, Francis, A., assistant engineer to the *Ramillies*, undated.

Constable, James S., assistant engineer to the *Revenge*, to date November 6th.

Cook, John A., engineer to the *Hussar*, to date December 3rd.

Crawley, James D. W. H. F., assistant engineer to the *Indefatigable* (temporarily), to date December 3rd.

Crichton, G. E. A., engineer to the *Indefatigable*, to date December 3rd.

Davis, Rayner, assistant engineer to the *Revenge*, to date November 6th.

Evans, Alfred, (probationary) assistant engineer to the *Nile*, to date November 3rd.

Fleetwood, John L., engineer to the *Revenge*, to date November 6th.

Foster, Edward M., assistant engineer (temporary) to the *Ramillies*, undated.

Garwood, Harry T., engineer to the *Prince George*, to date November 26th.

Gay, William H., staff engineer to the *Rodney*, to date November 10th.

Goodwin, Frank R., assistant engineer to the *Rodney* (temporary), to date November 19th.

Green, Thomas, staff engineer to the *Polyphemus*, undated.

Hughes, Thomas C.E., chief engineer to the *Indefatigable* to date December 3rd.

Jollife, Henry, fleet engineer to the *Revenge*, to date November 6th.

Kerr, A., chief engineer, has been advanced to the rank of staff engineer in Her Majesty's fleet.

Langmaid, J., staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet.

M'Carthy, John, fleet engineer to the *Vivid*, additional for service in the Reserve at Devonport, to date November 4th.

Milner, John W., assistant engineer (temporary) to the *Revenge*, to date November 6th.

Moore, Gerald, (probationary) assistant engineer to the *Ramillies*, to date November 10th.

Morley, Harold S., assistant engineer to the *Astræa*, to date November 18th.

Morris, Thomas, fleet engineer to the *Edinburgh*, to date November 3rd.

Murray, Thomas W. S., assistant engineer to the *Ramillies*, to date November 10th.

Newton, George S., fleet engineer to the *Enchantress*, to date November 3rd.

Nibbs, C. W., fleet engineer, has been placed on the Retired List, with permission to assume the rank of Inspector of Machinery.

North, Caleb J., fleet engineer to the *Howe*, to date November 3rd.

Northey, Gilbert, assistant engineer to the *Revenge*, to date November 6th.

Nye, Alfred J., staff engineer to the *Victory*, additional for the *Andromeda*, to date November 19th.

Pascoe, George, engineer to the *Hebe*, to date October 27th.

Rattey, William, engineer to the *Camperdown*, to date November 3rd.

Robertson, J. D., assistant engineer R.N.R., has been promoted to the rank of engineer.

Ryan, William, engineer to the *Beagle*, to date November 19th.

Sellex, John W. J., assistant engineer to the *Ramillies*, undated.

Sparks, Henry P., engineer to the *Victory*, additional for the *Surly*, to date November 10th.

Stainton, George H., engineer to the *Terror*, additional, to date October 1st.

Stewart, William H. W., engineer to the *Hawke*, to date October 27th.

Stone, Charles E., assistant engineer (temporary) to the *Revenge*, to date November 6th.

Swinney, Edward, engineer to the *Vivid*, additional for the *Gipsy*, to date November 16th.

Thompson, James M., chief engineer to the *Forte*, to date October 27th.

Turner, William F., chief engineer to the *Vivid*, additional for the *Pactolus*, to date November 16th.

Watson, James H., chief engineer to the *Pembroke*, additional for the *Terpsichore*, to date November 10th.

Ward, Edward V., assistant engineer to the *Mersey*, to date November 18th.

Williams, Walter K., engineer to the *Revenge*, additional for the *Boxer*, undated.

Wilshin, John B., assistant engineer to the *Hussar*, to date December 3rd.

HOAR & BROWN'S HARDWOOD MARKET REPORT, NOVEMBER 23rd, 1896.

TEAK.—

Landings	...	101 loads (logs)	...	130 loads (planks)
Deliveries	...	843 ,, ,,	...	474 ,, ,,

The deliveries are large, and the landings unusually small, prices are growing firmer, and stocks of good quality are becoming short. The second-class accumulation or old consignments are finding buyers, and there is now only a small quantity of this cheap wood left. Shippers are asking increased values, and they have obtained higher prices for each consignment over its predecessor. The market looks very firm, and appears to be rising. Several large enquiries are about, which will swallow up the major portion of landed stocks should the orders be placed upon the London market.

The plank trade has been brisk, while the landings show a falling off, prices are good with an upward tendency, and stocks are comparatively light. All the early and cheaper importations are now cleared off the market, and consumers have to face the increased values asked by the shippers. High figures will naturally curb consumption, and wholesale merchants must be careful not to hold large stocks at these increased prices.

MAHOGANY.—Business has continued brisk, and prices are generally firm, especially for prime qualities.

TOBASCO.—All round the prices are well maintained.

MINATITLAN.—Prime logs are in request.

TECOLUTLA.—The market is bare, but low figures are the usual result with large importations.

HONDURAS.—Steady prices are ruling, and the remaining stock will meet with firm support.

NICARAGUAN.—Up to the present these new importations have been limited, but upon arrival have been selling at firm rates.

PANAMA.—Sound parcels would find a ready and full-priced sale. Some mixed parcels are shortly offering by public sale.

AFRICAN.—Good quality and sound logs of medium to large dimensions have been finding purchasers at remunerative prices, but low-classed and shaky wood has not been required, and consequently values have lately touched minimum.

CUBA.—This market is extremely good, especially for the larger sizes, and by reports of future arrivals, which are likely to be small, there is every prospect of an unusually high-priced market.

ST. DOMINGO.—Stocks are lighter, and good qualities are wanted.

CEDAR.—The demand is limited, and a very uncertain market is prevailing. Long boat-building logs will find willing buyers.

PADOUK.—Sales have lately been made at steady prices, but business is being done upon a moderate scale.

KAWRIE PINE.—This has been going fairly well at full values, showing an increased demand for this favourite wood.

WALNUT.—Large and best logs for the knife are selling extremely well, but the minimum remains low for common timber, although trade is fairly good for anything offering cheaply.

Lumber of first quality is much wanted, and values are advancing, and the rise in freights is helping the heavy inferior stocks which is at last showing signs of reduction.

WHITEWOOD.—Logs are seldom asked for, but some large sales have lately been made in planks and boards, with the expectation of higher figures consequent upon increased freights being demanded.

SEQUOIA.—Only one cargo is now on market, and fair prices are being obtained; nothing further is expected to arrive for some months, consequently the market has a fair outlook.

Altogether business may be termed as brisk throughout the several classes of hardwoods, and all appearances lead one to expect a continuation of full prices.

BOARD OF TRADE EXAMINATIONS.

EXTRA FIRST CLASS.

October 24th, 1896.	Johnson, Lance	Ex. 1C	Liverpool
,, 31st, ,,	Peacock, J. F...	Ex. 1C	Bristol
,, 31st, ,,	Sharpe, Albert	Ex. 1C	N.Shields

NOTE.—1C denotes First Class; 2C, Second Class.

October 24th, 1896.

Anson, O.......	2C	Cardiff
Briggs, G.	2C	London
Brown, J.......	1C	W.H'pool
Chicken, W. A.	2C	Cardiff
Gray, H. G.....	1C	Glasgow
Greig, J. A.	2C	W.H'pool
Henderson, R.R.	2C	Hull
Hibbins, H. N.	2C	Bristol
James, H.......	2C	Cardiff
Jayne, W.G. ..	2C	,,
Johnstone, A. ..	2C	Glasgow
Jollife, C. H. ..	2C	Cardiff
Jones, Fred. R.	2C	Liverpool
La Roche, W...	1C	Glasgow
Low, W.	2C	Dundee
MacLennon, A.	2C	Cardiff
McIsaac, J.	2C	Glasgow
McRostie, P. ..	2C	,,
McQueen, D. S.	2C	Liverpool
Meiklereid, C. A.	1C	Hull
Nash, R. E.	2C	Cardiff
Neisham, E. A.	1C	W.H'pool
Parrott, G.	2C	Hull
Pearse, N. G...	1C	London
Phillips, T. R.	2C	Cardiff
Samples, S. G.	2C	Liverpool
Sanders, G. A...	2C	W.H'pool
Sanderson, F. B.	1C	,,
Searmonth, J.B.	1C	Glasgow
Smith, D.......	2C	,,
Steele, W. J. ..	2C	S'th'mptn
Stewart, J.	2C	Glasgow
Still, F.	2C	London
Storer, E. C. ..	2C	W.H'pool
Storey, Chas. E.	1C	N.Shields
Taylor, J.......	2C	Dundee
Thomson, J. S.	2C	Glasgow
Todd, A. M.....	2C	Hull
Urquhart, A. ..	2C	Glasgow
Waight, T. C. ..	2C	London
Williamson, W.	2C	Lond'ry

October 31st, 1896.

Cook, F. W.....	2C	Aberdeen
Crosbie, James	2C	Liverpool
Davidson, G. W.	2C	S'nd'land
Deare, J. J. W.	2C	London
Emslie, A. M. B.	2C	Aberdeen
Farquhar, T. J.	2C	S'nd'land
Garden, W.	2C	Aberdeen
Henderson, D...	1C	Liverpool
Johnson, F. E.	2C	,,
Jolliffe, J. J. ..	2C	London
Kelly, W.	2C	,,
Knight, G.	1C	Aberdeen
Partridge, J. V.	1C	Liverpool
Ramsay, D.	1C	London
Ramsay, G.	1C	Aberdeen
Reid, A.	2C	,,
Siddall, James .	2C	Liverpool
Witt, H. A.	2C	Aberdeen

November 7th, 1896.

Anderson, W. T.	1C	N.Shields
Campbell, J. L.	1C	Glasgow
Colquhoun, M..	1C	,,
Copus, C. G. ..	1C	Cardiff
Danopoulos, A.	2C	,,
Davies, Thomas	1C	Liverpool
Evans, C.....	2C	Cardiff
Fergusson, W.L.	1C	Glasgow
Fontaine, J. H.	1C	,,
Geddes, J.	2C	,,
Grant, J. H. ..	1C	London
Guthrie, H.	2C	Glasgow
Hutchinson, H.	1C	London
Johnson, H. M.	2C	Dublin
Jones, John E.	1C	Liverpool
MacOnegal, J.	1C	London
McCulloch, H.L.	1C	Glasgow
Mc Geachin, D.	2C	,,
Mc Phee, D.....	1C	,,
Miller, T.......	1C	N.Shields
Nicoll, W.	1C	London
Oxtoby, G.	2C	Hull
Rawson, T. W.	2C	,,
Rhynd, J.......	1C	Leith
Sykes, F.	1C	London
Tone, T.	1C	N.Shields
Watters, W.....	2C	Leith
Winn, G. W. ..	1C	Hull
Worsnop, F.....	2C	,,

*[For want of space we are obliged to hold over Patent List until next month.—*ED.*]*

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"BITUMASTIC." See Page 41.

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Lane, London, W.C.

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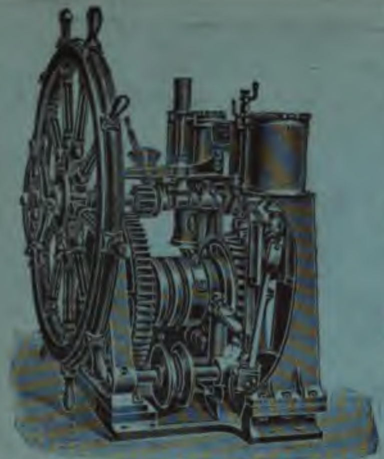
See page x for particulars.

For Index to Contents, see page xix. For Index to Advertisements, see page xvii.



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MARINE ENGINEERS

WRITE

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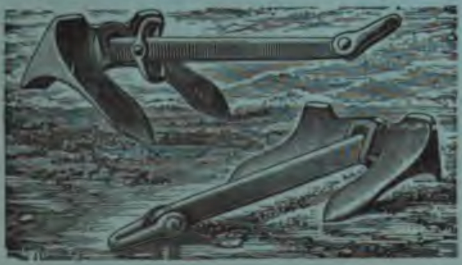

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PATENT "STOCKLESS" ANCHOR,
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STOWS UP HAWSE PIPES, DISPENSING WITH "CATTING AND FISHING" GEAR.
Adopted by the British and other Governments and the leading Shipowners.
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The Marine Engineer.

LONDON, JANUARY 1, 1897.

INVENTION, so fertile in many directions, has long neglected the improvement of the valves and connections which form so important an adjunct to boilers. Yet the existence of Boiler Insurance Companies, the continuous registration of boiler explosions and the attempt at inspection or prevention under the Boiler Explosions Acts of 1882 and 1890, are effective reminders that all is not yet for the best. Parliament on the one hand and trade unions on the other have alike realised that the maximum of public safety has not yet been reached, and have done their best under existing conditions to provide against the evil. But they have sought to cure rather than to prevent, mainly, perhaps, because they were unable to grapple with the real cause. Hence it is that we can welcome any serious effort to overcome the defects which have led to the avoidable loss of life and damage to property caused through explosions of valves constructed on the old principles. It was our appreciation of its novelty and practical value that induced us to reproduce in our last issue the paper which was read by Mr. James Casey before section G of the British Association at the recent Liverpool meeting. In that paper, after dealing with existing valves for high pressures, whether of steam, water, or other fluids, Mr. Casey described "a new spherical balanced valve for all pressures," of which he is the inventor and patentee. Knowing from his experience as a consulting marine engineer, that a fruitful cause of explosions is the absence of drainage for the condensed water in the pipes, or rather as he puts it, "from steam and water pressure combined at the same moment of time," he applied himself to the invention of a new valve which is simplicity itself. Discarding the old system of lifting, and its liability to get out of order, he has designed a valve of globe form, which, as he demonstrates, is balanced under all pressures. Not only is this all important result attained, but an effective means is afforded of draining pipes and other connections of all water created by condensation of steam, while it is so worked that no grit or sandy matter can get between the valve and seatings. We refer our readers to the paper itself, published in our December number, and the diagrams which accompanied it for the full technical description of this useful invention, which appears to have highly impressed such experts as Sir Frederick Bramwell, Sir Douglas Fox and Professor Hele-Shaw, not speak of others who attended the meetings of the British Association. It is worthy of serious attention when we find from experiments made and given (in the appendix A of Mr. James Casey's paper), at the instance of the German Government, that with a boiler pressure of 70 lbs. only, water being allowed to accumulate in the steam pipes, and the valves suddenly turned on, the steam pressure rose to and exceeded in one instance the astounding pressure of 2,133 lbs. per square inch. Is it any wonder that it is reported officially that during one year no less than 20 per cent. of breakdowns occurred to valves and gear? No doubt if the boiler breakdowns had been ascertained, we should have had a more fully complete list of disasters. To engineers, shipbuilders, and owners alike the new valve represents a vast improvement on the old kinds of valve, especially as the tendency towards the use of what were once considered abnormal pressures is becoming more and more marked in connection especially with marine engineering. With Mr. Casey's valve the limit of working is the resistance of material used in its construction—cast iron or gun metal. Its spherical shape allows equal expansion and contraction, leaving practically no margin for explosions owing to the drainage of the pipes already referred to. In a word, the new system seems eminently designed to prevent such an explosion as is recorded in the Board of Trade report for the year ending June 30th, 1896, under the Acts of 1882 and 1890, as having occurred on the *Orient* s.s. (Orient Steamship Navigation Co.), which was due to "the impact of water, the engineer having omitted to drain the pipe thoroughly." Many such cases have been officially recorded both on land and sea.

THE Belleville water-tube boilers of the *Terrible* and *Powerful* have so far proved an undeniable success. Great interest has been taken in the construction and ultimate success or otherwise of these vessels, not only because of the enormous tonnage and engine power of the two largest cruisers in the world, but principally because they are a test of a most bold experiment by the engineering experts of the Admiralty in the face of much rabid criticism and discouragement. Mr. Durston is much to be congratulated upon the courage with which he has maintained his conviction against a so hostile opposition. Should experience eventually prove the reliability and fairly long-lived character of the newly adopted water-tube boilers for such large war vessels, the present innovation marks a progress towards efficiency with a remarkable saving of weight, as great in one year as has hitherto been effected in the course of half a century. This will be seen when we point out that the new water-tube boilers will carry 260 lbs. per square inch as against the former maximum pressure of 155 lbs., whilst the new boilers are credited with a saving of 500 tons as compared with an installation of the old cylindrical boilers of the same evaporative power. The tests demanded by the Admiralty are most severe, comprising a trial of thirty hours duration each, at 5,000 I.H.P., no doubt to test economy at low speeds, and at 18,000 I.H.P. for the conditions during a high-speed cruise. The full specified H.P. is 25,000 indicated, and at this power the tests have to be for four consecutive hours, to be immediately followed by another four consecutive hours' run at 22,000 I.H.P. When these tests have been successfully accomplished at good speed, and with economy of fuel, there will be no doubt as to the excellent success that will have been attained by these magnificent vessels. So far the trials seem to augur a grand success in all respects, though accompanied in the first instance with some apparent defects as to details. The *Terrible* led off the ball with her first series of tests at 5,000 I.H.P., with the following very good mean results. Total I.H.P. 5,111; speed per hour by patent log, 13·43 knots; revolutions of engines, 64·5 per minute; consumption of coal, 2·57 lbs. per I.H.P. per hour; which was an exceptionally good speed for the power used, and not a bad result as to consumption at so low a power from engines designed to develop five times that power. On the higher trials, however, it was found that the engines required some considerable re-adjustment, though we have heard no complaints as to the steaming power of the boilers throughout. In the mean time, whilst the *Terrible* was laid up, her sister ship, the *Powerful*, was sent out with the same crew for her test runs. Heavy, boisterous weather interfered with these tests for some time, but eventually she completed all her test trials with the greatest success, some advantage no doubt being gained by the experience of the stokers in the first trials. In her first 30 hours' trip at 5,000 I.H.P., only 16 out of the 48 boilers were used, her mean indication was 5,000 H.P.; revolutions per minute, 67·2; speed by patent log, 14 knots, and coal consumption per H.P. per hour only 2·07 lbs. The second test trip was equally successful, though deferred for some weeks owing to stress of weather the mean I.H.P. being 18,143; speed, about 20 knots; revolutions, 102·8; and coal consumption only 1·83 lbs. per I.H.P. per hour. This is a splendid result, and it was expected that she would do as well in the 25,000 H.P. tests with a considerable increase of speed. It was found, however, that after an hour or so at the maximum power in her first test that there was an undue accumulation of heat in the casings of the ammunition passages, and in the vicinity of the funnels along the main and upper decks, so it was considered advisable to postpone the final trial until the casings were lagged with silicate wool. This has been done with both the *Terrible* and *Powerful*, and the funnels have been slightly lengthened. The guns and torpedoes were also fitted, and towards the end of November the *Powerful* went out to complete her full trial at maximum power. This was most successfully accomplished against a strong head wind and a choppy sea, the mean I.H.P. being considerably over 25,000, the mean revolutions being 114, and the mean speed 21·8 knots. The boilers, upon which most interest was concentrated, behaved admirably. There was no lack of steam throughout the trial, the safety valves blowing off all the time, whether with the wind ahead or astern, and the suitability as regards steaming power of the Belleville boiler for the largest warships has thus been amply demonstrated.

THERE is nothing more calculated to raise the ire of the usually law-abiding Englishman than that the taxation, which he usually pays with cheerfulness, should be unjust in its incidence, or that he should not get full value for which he pays. This is the case at present with the shipowners, who are dissatisfied with the relative incidence of the Mercantile Marine Fund, and the purposes to which the large income derived from it is at present allocated. There appears to be much justice in many of their contentions. The adequate lighting of the coasts of Great Britain is a matter in which all members of the nation are interested, and in which other nations who have vessels passing our coasts are equally interested. This would appear to invest this department with an international character, the cost of which should be defrayed from the public purse, and be thus shared by all. The Governments of the United States, of Germany, Holland and Belgium, have recognized the international character of the obligation, and thus exempt all vessels coming from each other's ports from the payments of all light dues. Whilst Britain keeps out of this international pact she is refused the above privilege in foreign ports, and we have no means of making the foreign vessels passing our coast or their Governments to pay any contribution, direct or indirect, for the use of our lights. On the contrary, our vessels trading to the ports of the above-named countries are even handicapped above their foreign competitors by paying dues from which the others are exempt. The waiving by the United States and foreign Governments of this impost on British shipping, were our coast lighting placed on an international footing, would be a direct contribution by other

Governments to our own, for the general use of coast lights. Apart, however, from this point of view, are two serious flaws in the administration of the Mercantile Fund for the purposes to which it is now devoted. First, if the shipping of this country is to be burdened with a direct charge for maintaining its lights, why should not all shipping that have the advantage of such lighting be included in the impost? And if so, why are the vessels of the Navy and the large fleet of private yachts exempt? The yachts, being "objets de luxe," could well bear the impost, and the incidence of part of the impost on the Navy would be a step towards the national character of the obligation. Second, if the apparent injustice to a special trade of being saddled with a national obligation is to be maintained as it at present exists, it is at least scanty justice that the impost should at any rate be no more than suffices to maintain such lights in efficiency. This, however, is not the case, there has always been a large profit balance between the receipts from lighting rates levied and the cost of maintenance of such lights, and the balance is regularly diverted to the extent of about £116,000 per annum, during the last seven years, which has been appropriated for covering the debit balances in other matters largely consequent upon the remission of shipping fees, which it was stated at the time of their abolition would result in a remission to the seamen of £400,000, and to the shipowners of £500,000. As the deficiencies are now found from the Mercantile Shipping Fund, levied on the shipowners alone, the seamen have got off the payment; but the shipowners have to find their own original contribution, levied in a different way, and the seamen's remission into the bargain. It is curious and obviously unjust also to the shipping trade that they alone of all trades have to individually bear what we may call the policing and inspecting of their own fleets, originated for the better safety of the seamen, passengers, &c., and thus for the community at large, as distinguished from the shipowners themselves and their property. This, on the face of it, should be a general charge, as in coal mines, factories, railways, &c. Probably the simplest way to bring home the malversation, as we term it without exaggeration, of the Mercantile Marine Fund, would be to analyse and decentralize its respective receipts and expenditures, on the basis that all who obtain advantage from the various departments maintained by this fund should be brought strictly into line as contributors thereto, and that no specific impost should be greater than would suffice to maintain that department in efficiency. This re-arrangement would render possible the remodelling of the various rates of foreign and coastwise dues, which at present seem very unfair in their respective incidences, and the country would have to look round to find at least some suitable balance of funds for such services as are for the benefit of the nation at large.

NEW ZEALAND has taken an important step in the recognition of the status of the marine engineer as an officer, and the necessity for the services of duly certified engineers on all steamships trading to and from New Zealand ports, and that such officers shall be carried in due proportion to the I.H.P. of the vessels, such I.H.P. to be assessed not upon any arbitrary measurements, but upon the average H.P. indicated during the previous six months, as shown in the engineers' log book. This magnificent reform is embodied in an Act just passed by the New Zealand Parliament, the Bill having been untiringly supported and initiated by Mr. A. K. Hislop, the Secretary for the Wellington District, to whom the engineers' thanks are due for obtaining a recognition for them, which places marine engineers carrying on their profession in New Zealand in the foremost position in the Mercantile Marine of the British Empire. The schedule to the Act defines that any steamship of not more than 150 I.H.P. must carry one second-class engineer. If over 150, and not more than 300, when running more than 300 miles between terminal ports, the vessel must carry a chief and second engineer. Between 300 and 1,250 I.H.P. the vessel must carry three certificated engineers when running more than 300 miles between terminal ports. And for every additional 1,250, or part of 1,250 I.H.P., if engaged in the foreign or intercolonial trade, an additional engineer must be carried. Beyond this the body of the Bill defines for the first time the recognition of the qualifications for a third-class certificate, which is a five years' apprenticeship in engineering workshops with certain alternatives. Further than this, the rating of chief to fourth engineer is defined as an officers' rating, specific and comfortable cabin accommodation is provided for, and in all disputes and investigations relating to a steamship casualty, at least one of the assessors shall be a person holding a first-class engineer's certificate. The ventilation of the engineers' rooms, engine-rooms, and stoke-hold are also to be subject to the satisfaction of an engineer surveyor. This is a great triumph for the marine engineer, and we hope that all our colonies and the mother country will follow suit in fully recognizing the necessary and important status of the marine engineer in the steam Mercantile Marine.

SHIPS' WATERTIGHT DOORS.

THE importance of the efficiency and facility of working of ships' watertight doors has engaged the attention of nearly all the prominent men in connection with shipping.

This has been more impressed on the mind of the public since the terrible disaster to H.M.S. *Victoria*, in June, 1893; also the collision between the s.s. *Crathie*, and North German Lloyds s.s. *Elbe*; and quite recently the catastrophe to the s.s. *Drummond Castle*, belonging to Messrs. D. Currie & Co. In each of these cases, over 300 lives were lost. These disasters might have been averted had the bulkhead doors been closed immediately after the accident occurred. This has only to be remembered to show that prompt action is required by adopting some method of preventing occurrences of this kind. For this Mr. O'Brien, late of the Engine Department of the Fairfield Shipbuilding and Engineering Co., Limited, Glasgow, has invented an improved means or apparatus for closing watertight doors of ships' bulkheads, automatically or by hand. The feature of his patent is very simple, it consists of a bracket extending across the door, and made fast to the framework at the top. This bracket is recessed for containing the worm for working the rack on back of door. In this bracket and at the top and bottom of the worm, are placed eccentric bushes with a lever made fast. To this lever there is attached a connecting rod, the other end being connected to a bell-crank, which is fixed to the bulkhead, and to the other end of this crank is made fast another connecting rod, which extends downwards to the bilge of the ship, where it is fixed to a float, so that when from a collision, or other cause, the water gets into any compartment of a ship where this gear is fitted and rises high enough to lift the float, it at the same time pushes up the rod attached to it, by which action the position of the bell-crank is altered, and pushes the rod attached to the lever on eccentric bushes, moving them round in the bracket about a quarter of a turn, thus taking the worm out of gear with the rack on the door:—then the door immediately descends, but to prevent it from coming down too hurriedly and injuring the frame-work, there are two balance cylinders fixed, which allow the door to fall gently into its normal position.

Mr. O'Brien is of opinion, that all watertight doors should be under the control of the officers on deck, as well as the engineers. For this purpose, the automatic gear is connected to levers on the navigating bridge, so that the officers in charge can manipulate the doors at will. We understand this invention can be adapted in every case without dispensing with the gear at present fitted, to meet the Admiralty or Board of Trade requirements, and that the highest results are attained at a very moderate cost.

In order that our readers may clearly understand this gear we have pleasure in illustrating it in the adjoining diagrams, of which Fig. 1 is a front and Fig. 2 a side elevation of the invention.

Fig. 3 is a similar view, showing the apparatus when the door has been automatically closed into its normal position and the worm out of gear.

Fig. 4 is a plan of the watertight door with the bracket extending across the door for carrying the two cylinders. Those cylinders with their pistons and piston rods are to prevent the door from coming down too hurriedly; this bracket also carries the worm for working the rack, and also shows a plan of the automatic gear with the worm in gear, the rack and the eccentric bushes in position.

Fig. 5 is a similar view, showing the eccentric bushes in a different position and worm out of gear with the rack.

A represents the float placed in the bilge of the ship convenient to the watertight door; B the lever connected to a rod made fast to the float, and which acts as a guide to the float; C the connecting rod made fast to bell-crank lever E, carrying a balance weight F adjustable to take up the weight of gear. G is a connecting rod made fast at one end to the bell-crank lever E, the other end of which is made fast to lever I, connected to the eccentric bushes H at top and bottom; D is a cross handle fixed on connecting rod C, and is an additional means for working the gear; J is a bracket extending across the door made fast to the frames of the door on which are made fast the two cylinders L, the piston-rods pass through the bracket and are fixed to the door. K is a rack on back of door; M is the gear for working the door by hand; N is a chain or rope working over pulleys connected at one end to bell-crank lever E, the other end being connected to hand lever O, placed in any convenient position, so that the officer in charge can shut the doors of any compartment.

As some watertight doors are fitted with a long screw and a nut made fast on the back on the door, to meet this method of fittings and the requirements of those that may adapt them, the eccentric motion is here placed on a square shaft extending up the side the whole length of the door with the nut in halves placed in the bracket on back of door. The same operation as described above throws the two parts of the nut out of gear with the screw and the door immediately descends. Mr. O'Brien's address is 21, Ibrox Terrace, Glasgow.

CONVERSAZIONE OF ENGINEERS AND NAVAL ARCHITECTS.

ON Wednesday, 2nd ult., the Society of the Hull and District Engineers and Naval Architects gave themselves up to the allurements of a conversazione in the Central Hall. There is something specially interesting about this annual event; it becomes more popular year by year. If anything, the number present on this occasion was too large. At the outset, there was a reception by the President and Mrs. Pawley. Amongst the guests were Mr. J. B. Edmiston (Liverpool), Mr. E. Gearing and Mr. J. Batty (Leeds Forge), Mr. P. Hodges (Sheffield), Mr. T. Carlton, Mr. J. Charlton and Mr. R. B. Faller (Grimsby), Mr. H. P. Marshall (Leeds), Mr. W. Harris (Board of Trade), Mr. H. P. Cornish (Lloyd's), Mr. H. F. Fourny (Bureau Veritas), Mr. Geo. Bohn, Mr. R. Carson, Mr. G. J. Cole, Mr. W. B. Dixon, Mr. W. Gemmell, Mr. J. H. Leetham, Mr. F. H. Pearson, Mr. T. Rose, Mr. J. Spear, Mr. M. Stirling, Mr. E. Tindall, Mr. A. H. Tyacke, Mr. W. H. Willatt, Mr. J. Sawyer, Mr. R. A. Hagestadt, Dr. Riley, Dr. Daniel, Dr. Darwent, Mr. E. Williamson, Captain W. W. Hall, Mr. A. Black, Mr. W. H. Brodrick, Mr. C. Clark, Mr. G. Clark, Mr. R. J. Durley, Mr. T. Wright, Mr. R. T. Bruce, Mr. W. Runton, Mr. George H. Strong (hon. secretary), and Mr. Herbert Dunkerley (assistant hon. secretary). When dancing commenced the scene was very effective. The dresses of the ladies were

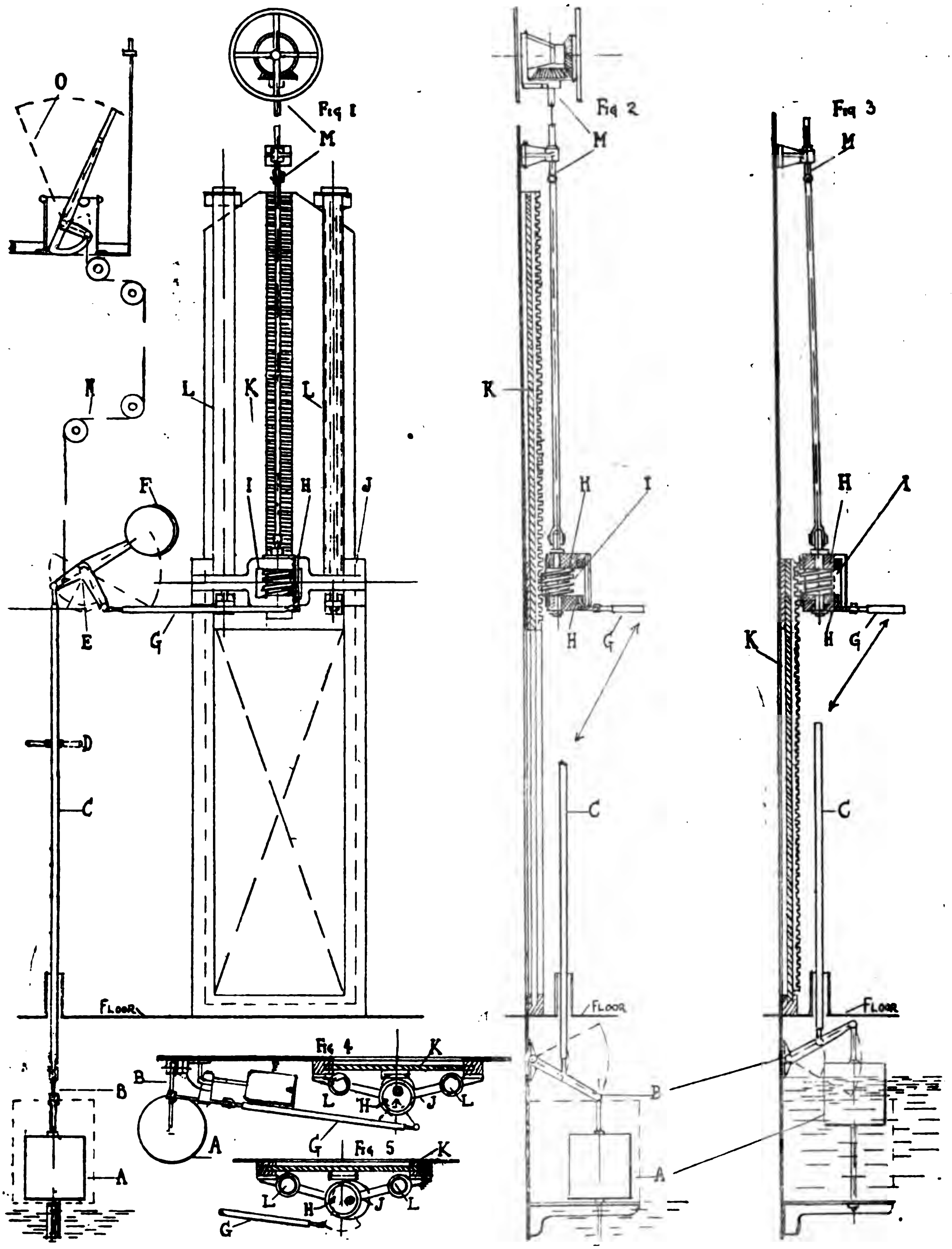
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Fig 5
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Ships' Watertight Doors. (*See Page* 388.)

pretty. The dazzling red which has recently figured conspicuously in Hull streets is ubiquitous—it was there at the conversazione. The room was effectively decorated with canopies of white and amber. The far end of the hall was arranged as a drawing-room, and in the large room adjoining there was a free buffet, managed by Mrs. Tune. The dances were interspersed with songs by Dr. Daniell, Captain Hall, Mr. R. Pawley, Mr. A. N. Newton, Mr. J. Dent Hickman and Mr. R. A. Hagestadt. Everything went merrily, thanks to Mr. Geo. H. Strong, who was the M.C., and to Messrs. M. Stirling G. Clark, J. H. Leetham and W. Runton, who were the stewards.

INSTITUTE OF MARINE ENGINEERS.

On Friday evening, December 4th, a large assembly met in the Town Hall, Stratford, to celebrate the eighth anniversary of the founding of the Institute of Marine Engineers, and to receive the address from the President, Sir Edwyn Sandys Dawes, K.C.M.G., who is at the same time the foremost man in the shipping world. Very complete arrangements had been made for the occasion by a committee, headed by Mr. William I. Taylor as convener, and the programme comprised organ recitals, a selection of vocal and instrumental music, and a ball. The large hall had been very tastefully decorated, and there were numerous exhibits of special interest to those connected with engineering, including specimens of electric welding (Thomson's patent) framed photographs relating to subjects taken by X-rays. An indicator which shows the angle of heel when ship is in a sea-way, also students' drawings and earlier drawings by senior members created much attention. Mr. James Wimshurst showed some very instructive and amusing experiments with electricity in one of the ante-rooms.

One pleasing feature in connection with these social events of the Institute is the presence of the youngsters whose fathers are at sea, showing that the Association retains a close link with its members and their families, and thus learning the rising generation to look to the society with friendly interest.

The President arrived at 7.30, and was received by the hon. sec., hon. treas., and a committee appointed for this duty.

After a tour round the hall, he was accompanied to the platform and gave the following address amid frequent cheers and applause:—

The Institute of Marine Engineers, established for the purpose of drawing members of [the profession more closely together and increasing the *esprit de corps* amongst them, may specially be regarded as educational, and this has throughout been exhibited by the excellence of the papers read by members at its meetings, and the interesting character of the discussions upon these papers which have followed.

It is highly gratifying to note the steady increase in the membership, as shown by the annual reports of the honorary secretary, and this is especially so in the case of graduates and junior members, for whom classes and lectures are now provided for their instruction and encouragement.

Another interesting feature is the interchange of papers and of courtesies between this Institute and kindred societies at home and across the seas, inasmuch as each country now has its representatives on the roll book.

Engineering, long neglected in our national educational system, is now recognised in many of our Universities as a science and an art. At Dublin, Durham, Montreal, Calcutta, Madras, Bombay, and probably at other of the Colonial Universities, there are faculties of engineering in which bachelor and masters' degrees are conferred. At King's College, London, there is a department of engineering, and at the universities of Edinburgh, Glasgow, Manchester, and the Royal University of Ireland, the subject of engineering is taught in its various departments—civil, mechanical, mining, electrical, military, sanitary, and marine, the last being that now occupying our attention.

In embryo the marine engineer may be said to have existed from the time when the first mechanism was applied to the propulsion of vessels, whether by oars, or masts yards, and sails, although disowned by your motto, "*nec remis, nec velis*," but his special work dates from the introduction of machinery impelled by steam about a century ago. Scotland and the United States—the Clyde and the Hudson—were the first cradles of the craft, and with her craftsmen Scotland in earlier days largely manned the marine engineering of the world, and educated its marine engineers.

The mention of the Clyde and the Hudson naturally recalls to all engineers the well-known names of Symington and Fulton, the pioneers of steam navigation. It is not my intention, however as a shipowner, and before an audience like this, possessing such an intimate acquaintance with the historical development of marine engineering, to enter into the well-known details of its progress. It is my object rather to draw some attention to the important duties which now devolve upon your profession in all that concerns the strength, the security, and the general well-being of the nation.

The sufficiency in number and efficiency in physical and mental power of our marine engineers are essential, 1st, in the naval defences and commercial development of the Empire; 2nd, in the intercommunication between Great Britain and her colonies; and, 3rd, the importation of food for the increasing population of our islands, and the raw material needed for our industries.

Little more than a single generation has passed away since the nation contentedly imagined that the wooden walls of old England and her gallant seamen provided every security for defence. We gloried in the achievements of Drake, Hawkins, Anson, Jervis, Howe, Nelson, and other of our grand old sea captains, and confidently looked to a continuance of the same immunity from attack, solely from the superiority of our seamanship; but what a revolution in maritime affairs this short interval has brought about.

At our annual dinner on the 17th June last, I ventured to intrude upon you my own impressions when witnessing the bombardment of Sebastopol by the combined fleets of France and England forty-two years ago. Magnificent and picturesque were those old wooden ships, and although many of them, not having steam power, had to be towed into action, all beholders deemed them invincible; but how soon after this were we rudely awakened to the fact that wood could not contend with iron and steel, and that steam machinery, hydraulic power, electricity and the other mechanical forces unknown to our forefathers would now have to play an equal part with seamanship and navigation in our struggles for naval supremacy.

Never in the history of England has the nation more consistently demanded that the strength of our naval forces should be increased in proportion to the growing requirements of our commerce and expanding Empire. This demand, which makes for peace as well as security, may be regarded as distinctly emanating from the people, and indicating their perception of the seriousness of any naval weakness. If proof was needed that the demand was the result of an intelligent appreciation of the position, and not merely spasmodic, it is evidenced by the ready acquiescence of all parties, apart from parliamentary distinction, in granting the additional expenditure asked for by successive Governments.

The absorbing interest in this question has to no small extent of late been further stimulated by Captain Mahan's remarkable work, "The Influence of Sea Power upon History," and his demonstration that the possession of colonies unsupported by a powerful navy becomes a source of weakness. The Government having conformed to the national will, our naval architects and marine engineers fulfilling their part have for some years been exercising their inventive faculties in the direction of producing more efficient types of vessels required to fulfil the varied duties cast upon our naval services, and year by year we see ships of greater destructive power added to our fleet.

Our modern warship, whether ironclad, cruiser, or torpedo boat, is a mass of machinery, not only the propulsion, but the steering, lighting, pumping, anchoring, and ventilating of the ship, with the manipulation of the heavy guns, more or less appertaining to the duties of the marine engineering staff, whose professional acquirements are indispensable, whether in conflict with the elements or the enemy. In these emergencies success depends not only on the courage and efficiency of those on deck, but equally on those below and unseen, who have, with a cool head and a strong heart, to remain at their posts, obediently and intelligently regulating and controlling the complicated machinery upon which the movements of the ship depend.

In engineering there is little romance. Poet and philosopher find the subject too material and practical for their taste; all the more gratefully, therefore, do we welcome the following brilliant lines from the pen of Rudyard Kipling:—

"Lord, send a man like Robbie Burns to sing the Song o' Steam!
To match wi' Scotia's noblest speech yon orchestra sublime.
Whaurto—uplifted like the Just—the tail-rods mark the time,
The crank-throws give the double bass, the feed-pump sobs an' heaves,
An' now the main eccentrics start their quarrel on the sheaves;
Her time, her own appointed time, the rocking link-head bides,
Till—hear that note?—the rod's return whings glimmerin' through the guides.
They're all awa! True beat, full power, the clangin' chorus goes
Clear to the tunnel where they sit, my purrin' dynamoes.
Interdependence absolute, foreseen, ordained, decreed,
To work, ye'll note, at any tilt an' every rate o' speed.
Fra skylight lift to furnace-bars, backed, bolted, braced, and stayed,
An' singin' like the Mornin' Stars for joy that they are made;
While, out o' touch o' vanity, the sweatin' thrust-block says;
'Not unto us the praise, or man—not unto us the praise!'
Now, a' together, hear them lift their lesson—theirs an' mine!
'Law, Order, Duty and Restraint, Obedience, Discipline!'
Mill, forge, an' try-pit taught them that when roarin' they arose,
An', whiles I wonder if a soul was gied them wi' the blows."

We have been contrasting the marvellous ironclad of to-day with the wooden battleship of barely 30 years ago, but no less striking is the contrast between the huge steam liners which now maintain swift and regular communication on our ocean highways and the sailing vessels which, notwithstanding their small size and scanty equipment, formerly penetrated to the most distant parts of the globe in pursuit of trade and discovery.

Our surprise and admiration must ever be great when we recall the dangers and hardships attending the voyages of discovery by the intrepid old navigators, Columbus, Cabot, De Gama, Baffin, Davis, Cook, Tasman, and others, in their small sailing vessels, not larger than a moderate sized yacht of the present day. Their surprise and admiration, however, would be still greater could they now witness the daily departure of our Leviathan steam liners from London, Liverpool, Southampton and elsewhere, crossing the ocean at high speed, becoming increasingly greater year by year under the inventive powers of our engineers, and carrying their "townships" in numbers, with a degree of safety, comfort and even luxury, which the highest flights of imagination in those days could never have foreseen.

In every direction there are now admirably organized and well appointed lines of steamships keenly competing for the patronage of the public, and not only at both ends of the service, but at the ports along the whole course of their itinerary their administrators are ever being stimulated to further exertion in the direction of improvement by the pressure of competition and public criticism. On the great trunk routes to America, Canada, Africa, India, China, and Australasia, besides services to nearer countries, the steamers employed are every year becoming larger, swifter, and more luxurious. These great floating hotels, which reduce the perils and discomforts of the sea to a minimum, are, by encouraging travel, thereby tending to bring the peoples of the world into closer and more friendly relations with each other, breaking down the prejudices and distinctions of race and more vividly demonstrating the common interests of mankind.

Although Johnson, in 1825, earned the premium of £10,000 for his experimental voyage by steamer to India, the same year in which the first locomotive ran between Stockton and Darlington, Marine Engineering as a distinct science can hardly be dated earlier than 1838, when the first steam vessel crossed the Atlantic. From that time also commences the history of many of our leading and still progressive steam shipping companies, which have since performed with increasing efficiency the invaluable work of communication between Great and Greater Britain.

In 1839 the mail services to the West Indies were inaugurated by the formation of the Royal Mail Steam Packet Co. The following year saw the incorporation of the Peninsular and Oriental Steam Navigation Co., for India, China, and the East generally, the Cunard Co. for America, and the Pacific Steam Navigation Co., for South America. At subsequent dates mail services to Canada, the West Coast of Africa, South Africa and Australasia were established, and at the present time there is a complete network of steamship lines connecting not only all parts of the British Empire, but every sea-board of the habitable globe.

For a time England possessed almost a monopoly of these ocean communications, and where steamers of other countries were employed the engineers were usually Scotch or English. This is so no longer. France, Germany, Austria, Spain, Italy and Holland now compete with us by means of their own well-organized and more highly subsidized shipping companies, which trade not only to their own but to our possessions. More recently Japan has made extraordinary strides in the same direction, whilst Russia has gone a step further, and besides its mercantile steamers has its volunteer fleet, semi-commercial, semi-military in character, and all our foreign competitors employ marine engineers of their own nationality.

But apart from these regular steamship services, there exists a vast fleet of cargo steamers, preponderantly large, under the British flag, engaged not in any particular trade, but in the interchange of commodities wherever and whenever the demand for profitable employment arises; they travel like the swallows in search of food, and like them are influenced by the seasons. Coal, railway material, cement, and other cheap and bulky products, provide their outward cargoes, their homeward freights being grain and the raw materials used in our manufactures; but to attempt to describe the work which is found for the "Tramp," as these steamers are called, in contradistinction to the "Liner," would be impossible in a short address. The cheapening process in their construction and coal consumption which is ever going on, now permits of the transference of commodities at marginal differences of value so small in comparison with what they were, that the bulk available for transportation ever continues to increase, steam, with telegraphic communication, thus tending to equalize prices all over the world. Sailing ships, however, not being able to compete either in efficiency or economy are gradually becoming fewer, as evidenced by the fact that in 1874 the steam and sailing-ship tonnage was about equal, it is now in the proportion of about 24 to 1.

The principal work of these cargo steamers is, as said before, the importation of food for the people and the raw material for their industries—cotton, wool, jute, &c. Broad and bulky, for economically carrying heavy burdens, their movements are slow, and between the liner and the tramp we may draw the same comparison as between carriage and cart horses. But upon the successful performance of their work how much depends! for whilst the swift liner contributes to the luxury of travel, the cargo boat provides the very means of subsistence.

Our population is about two and a half times as large as it was when England was last engaged in a naval war; we are now dependent upon foreign countries for considerably more than half our food supplies, whilst directly and indirectly the industries of our people, in somewhat the same proportion, are dependent upon our external commerce.

Statisticians inform us that we seldom have more than two or three months' supply of food in the country, and, consequently, if by any political complications the useful work of these cargo steamers of bringing in fresh supplies of food and exchanging manufactured products were stopped, the condition of the people would be too terrible to contemplate, for our large population would then become a source of weakness instead of strength.

Such a contingency, however, has to be kept prominently in mind, and looking to the fact that our marine engineers form so important a factor in its consideration, the question is clearly one that is not irrelevant to the present occasion, and one which should be thoughtfully discussed in time of peace, instead of being left to the panic which would inevitably arise were we to be involved in a great maritime war.

Appreciating this extreme danger, we have taken, and are continuing to take, extraordinary measures to increase our navy, and the annual expenditure under this head, which may be termed national insurance, now exceeds eighteen millions a year. Notwithstanding this heavy expenditure, however, and even the addition of further millions in the same direction, the fact remains that the late Admiral Sir George Tryon and other competent naval authorities have clearly demonstrated that it would not be possible with any na y, however strong, to prevent the capture or destruction of many of our merchant ships.

If the statement of such experts is correct, which there is no reason to doubt, what would be the result? The United States lost their ocean-carrying trade, not by the comparatively small depredations of the Alabama, but because the excessive "war risks" insurance drove their trade into neutral vessels. What they lost then they have never regained, but they had not to face the far more terrible contingency of a starving population, deprived of work, as we should have, and should not their experience be a lesson and a warning to us?

I agree entirely with that able and gallant admiral, whose tragic death we all deplore, that in the event of war it would be the duty and the interest of the nation, on carefully thought-out and well-defined conditions, to assume the "war risks" connected with our commerce, and thus conserve our maritime interests. The responsibility and even the cost might be very great, but in comparison with the sufferings arising from an insufficiency of food for the people, the stoppage of their industries, and the loss of our carrying trade, they would be insignificant.

This question is too large and complicated for me to attempt to deal with in detail; but I venture to express the hope that the members of the Institute of Marine Engineers may regard it as coming within the scope of their deliberations, and bring it up for discussion at one of their meetings. The Government has at its disposal ample means for obtaining information, and a small committee of members of the Admiralty, of shipowners representing liners and cargo steamers, and of underwriters at Lloyd's, if appointed to consider and recommend what measures should be adopted in event of war, would be useful in the highest degree.

A very usual toast at Corporation dinners in the City of London is, "Ships, Colonies, and Commerce," and it has been my purpose to show how closely the marine engineering profession is bound up with these three great interests; but it cannot be made to stop there, for as we advance in civilization our various industries, professions, and interests, become so interwoven, that it is impossible to define where the influence of each begins and ends.

Mr. Rudyard Kipling's words on the marine engine, "Interdependence, absolute, foreseen, ordained, decreed," come in here to help us.

As each piece of machinery fulfils its own part in the complete and harmonious working of the engine as a whole, so is it in the body politic; and although the various parts cannot be gauged, measured, and corrected by dynamic laws or mathematical calculations, they are governed by laws no less absolute. As knowledge increases, and the peoples of the world are drawn closer together by the frequent intercommunication, we may hope there may be a recognition of one of the most important of these, namely, the interdependence of all communities.

Our national aim is to make the interdependence of Great and Greater Britain full and complete, working harmoniously like one of your grand marine engines. A greater ideal would be that all civilized countries should realize this mutuality of interest. Even as variations of climatic influences and geological productions create healthy commerce, so racial characteristics would tend to harmony, as a result of closer intercourse, were this law of interdependence of the human race universally acknowledged. If ever that consummation be reached, the science you are promoting will have played no unimportant part in its attainment.

In conclusion, gentlemen, I beg to express my sincere thanks for the kindness which you have shown to me during my year of office, an office which I recognise you gracefully invited me to fill, not from any merit of my own, but as a compliment to shipowners generally, whose interests are so closely allied with your own. The very friendly relations thus shown to exist between us, I hope, may long continue.

A. J. Durston, Esq., R.N.C.B. (past President), proposed a vote of thanks, referring briefly to a few of the prominent points in the address, and expressing the high appreciation of the plans and work of our merchant princes, felt by marine engineers, whose interests were so closely bound up with theirs in the carrying out of these plans to a successful issue.

The vote was carried by loud acclamation.

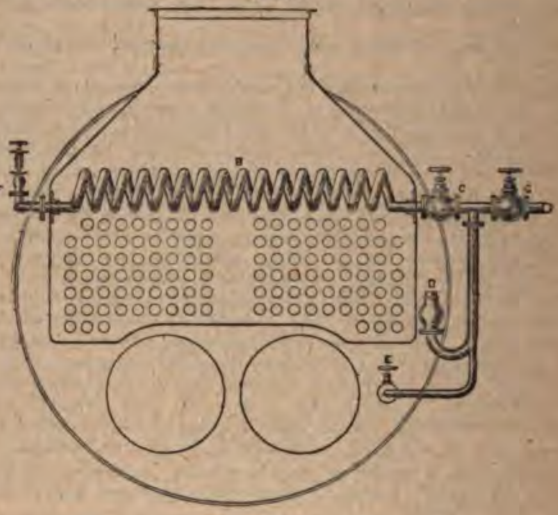
The following past Presidents were present: A. Beldam, G. W. Manuel, R.N.R.; A. J. Durston, R.N.C.B.; and vice-presidents, Prof. A. C. Elliott, D.Sc.; J. Flannery, M.P.; Alderman G. W. Kidd, A. W. Robertson, W. C. Roberts, R.N.R., Arch. Thomson, the hon. secretary, hon. treasurer, and all the members of Council.

Dancing was commenced about 9 p.m. and continued till 3 a.m. The master of ceremonies, Mr. Wm. I. Taylor, convener Recreation Committee, was assisted in his duties by Messrs. Geo. Threlfall and Geo. Neill.

THE "HARMAN" PATENT FEED-WATER HEATER AND CIRCULATOR.

It is a well-known fact that there is economy in a hot-water feed in whatever manner the heat is obtained. Thus, at the present time there are numerous varieties of feed-heaters in the market for marine purposes; some of which use steam from the low-pressure receiver, some from the intermediate receiver of a triple-expansion engine, and some live steam direct from the boiler. In all these there is an economy, least of course in the last case; but it must be evident to all engineers that if the feed can be heated by the waste heat in the smoke box, which otherwise would be absolutely lost, the economy should be considerably greater.

Fig. 1.



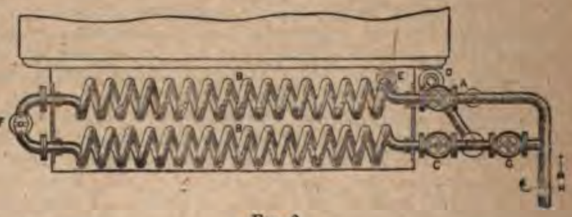


Fig. 2.

We have now the opportunity of presenting to our readers the description and illustrations of the "Harman" Patent Feed-Water Heater, which is designed to effect this object in a simple and effective manner. In the adjoining diagram Fig. 1 shows an end elevation of a boiler with the apparatus fitted thereto, and Fig. 2 is a part plan of the same.

It will be seen that the device consists of two or more coils of copper, size B, arranged in the smoke box; the feed-water is passed through these coils on its way to the boiler, and the hot gases in the smoke box surround them, the temperature of the feed-water being thus raised in proportion to the amount of surface given to the coils. The valve A is the inlet from the pump, while C is the feed valve and D the check valve to the boiler. A circulating valve E is fitted with an internal pipe to the bottom of the boiler, and a safety valve F and intermediate valve G are fitted in connection with or upon the feed pipe H.

It is claimed that these coils give no trouble and require little attention when working, the spiral form of the coils freely allows motion to take place, due to expansion and contraction from changes of temperature without undue strain on the joints; and this motion, it is stated, itself prevents scale forming in the coils.

In most devices for saving coal it is found that the practical saving is less than the theoretical, but with feed heaters this is not found to be the case, on the contrary, in practice it is found that the saving considerably exceeds that due to the actual quantity of heat added to the feed.

For example, there is no theoretical saving at all due to heating the feed-water with live steam taken from the boiler, treating the matter upon a pure thermal basis, but careful tests have shown that a saving does result from the practice—probably due to the hot feed interfering less than a cold feed with the natural circulation of the water in the boiler. This contention has been confirmed by the experiments carried out by Mr. Yarrow on the circulation of the water in his water-tube boilers.

In the case of the feed being heated, say from 120 deg. to 200 deg. by waste heat there is a theoretical saving due to the added heat of over 7 per cent., and this should mean that the surface of the boiler is required to absorb the heat from 7 per cent. less coal for the same evaporative power, and the boiler heating surface becomes more efficient, thus further increasing the saving.

For example, we understand that the s.s. *Dione* has been fitted with the "Harman" heater, and that instead of showing the mere theoretical saving of 7 per cent., in practice the actual coal consumption was reduced from 35½ tons to 31 tons, or about 12½ per cent. saving.

The apparatus also acts as a circulator; and some portion of the saving is probably due to its action in this respect, for when fires are lighted in a cold boiler or when fires are put away after being banked for some time, the coils commence to draw the coldest water from the bottom of the boiler through the valve E, and deliver it again through the boiler check valve D at a high temperature. In the above-mentioned steamer we understand it was found that after lighting one fire in one boiler, and before the fire had entirely covered the grate bars, the temperature of the water at the outlet of the coils was 200 deg., and the rattling of the check valve showed the circulation to be most active.

It will readily be conceded that this apparatus must have a beneficial effect upon the life of the boiler.

The sole licensees of this invention are Messrs. Worth, Mackenzie & Co., Limited, of Phœnix Works, Stockton-on-Tees.

Dock accommodation at Antwerp.—The Belgian Minister of Public Works has (we are informed), decided to extend the quays 3,000 ft. to the south, at a cost of four million francs. A channel 200 ft. wide and 24 ft. deep is to be constructed, surveys have been made further down the Scheldt, and the present works are only part of a scheme for a still greater extension of the port.

THE FLEETS OF THE MAIL LINES.

(From our own Correspondent.)

THE P. & O. Company's meeting was even more than usually interesting. In the first place we heard from Sir Thomas Sutherland the history of the P. & O. dock scheme and the final end thereof. Much of the story we already know, but for the sake of convenience it is well to tell the whole tale. The P. & O. agreement with the London Dock Companies was running out and they were told that they would have to make their payments in future on a new and more onerous basis. They naturally protested. They showed that already the charges on the Thames were far higher than elsewhere. The dock people replied that they must live. But the rejoinder was obvious. "You cannot make the customer you have, who only demands limited accommodation, pay for the great space and expenditure you have for the customers you have not. If you attempt to do so the only result will be that all your customers belong to the latter class and that you are left alone and lamenting." Argument was useless, and P. & O. prepared for action by buying the land on the Thames, where they proposed to construct wharves where their ships might lie, as they do at many ports both in Europe and in the East. This quickly brought the Dock Companies to their senses. The two interests are now the best of friends and the land by the river lies unproductive for the moment. But its actual cost was very small and its prospective value must be considerable, whilst the fact of its possession evidently enabled the company to dictate its terms to the dock owners and so to save much solid cash in future charges. Then as to the fleet. We were very plainly shown by the accounts and by what fell from Sir Thomas Sutherland, that there can be no finality in a fleet. Not only are improvements always going on in the machinery department, making the newer ship always the most efficient and economical instrument for the earning of freight and passage money, but the actual up-keep of old ships is a very great burden upon their owners. And so there is a constant addition of modern boats at one end of the fleet list and a constant loss of old ones at the other. The new ones come in at something like £30 a ton—in the case of the best mail boats of the line—and go away at prices ranging from £5 a ton in the case of those which are still workable, down to £1 a ton in the case of those which must go direct to the scrap heap. The present year has seen the addition of five cargo vessels of the ocean class. And, besides these, there is the steamer *Harlington*, a vessel of a new class altogether. The five cargo vessels are of some 5,000 tons deadweight capacity each. They are for the cargo trade to the Far East. The vessel of the new type is of a far less ambitious class. She is but one-fifth of the size I have named, but she will be employed in the coasting trade of our home shores and acts as a feeder to the bigger sisterhood. The year just commenced will see even larger additions to the P. & O. fleet. These include in the first place, 32,000 tons of mail steamer comprised in four vessels, the first of whom, the *India*, has just commenced work. Then there are the two twin-screw cargo boats of the *Candia* class, equal in size to the mail boats, so that during the current year, tonnage costing over £1,300,000 is being added to the material of the fleet. It will then total far above 300,000 tons.

The West India Royal Mail Steam Packet Company

proposes at the beginning of January to offer no less than three of its old compound boats for sale. These are the *Tagus*, *Tamar* and *Trent*, and I suppose that they are displaced by the advent of the three cargo vessels recently delivered by Messrs. R. Napier & Sons. Of the three now being discarded, the *Tagus* is the largest and oldest. She exceeds 3,300 tons in her gross measurement, and has completed her quarter of a century. She was built by John Elder & Company, and was fitted with new boilers thirteen years ago. The other two vessels are three years younger and are both just under 3,000 tons gross measurement. The former of the pair had new boilers in 1887 and the latter the previous year. They were both built at Renfrew by Messrs. Henderson, Coulborn & Co. All three vessels are, of course, fitted for the passenger trade, and all have electric light and refrigerating apparatus.

Disasters.

The loss of the North German Lloyd liner *Salier* is another of those terrible exactions which the Spanish coast wrings every now and then from the navies of the world, mercantile and fighting alike, without regard to nationality. Details are wanting as to the exact circumstances of the case, and though at first this fact was explained by the interruption of the land lines in Spain, it is unlikely that much more information than we already have will ever come to hand. The large quantities of wreckage which were coming ashore soon proved the truth of the report that the vessel was wrecked, even if her failure to turn up after a short run between two neighbouring Spanish ports had failed to excite the worst apprehensions. She is gone with all hands, and the exact details of her end must ever be hidden from human knowledge. Of course the general cause of her loss is easily to be surmised after the event. There have been continuous gales in the Atlantic recently, and there was set up that unusual current towards the Spanish coast which comes after bad weather outside, and which has been the cause of the loss of so many ships and so much life. The force and direction of this current seems to be, at times, far greater than mariners suspect. But I do not think that any modern appliances are likely to give them very great assistance. The deep sea lead is the best guide after all, and a wide berth should be given to the Berlings.

The *Salier* was just twenty-one years old, and had been built at Hull by the Earle Company. Recently she had been employed on the Baltimore line, but previous to her final trip she had been put into the River Plate route and was engaged in the carriage of steerage passengers and cargo from Bremerhaven and Spanish ports only, so that no British travellers had the opportunity to be aboard, whilst, in fact, those who did take passage by her were largely shipped at Corunna.

The Orient line, too, has had a repetition of the well-known *Austral* disaster with their *Oratava*. Fortunately for them the *Oratava's* scene of trouble was Tilbury Dock and not the open waters of Sydney Harbour. But it was the same old story of loss of stability through coaling, a sudden heel, and an inrush of water through the open ports. Unfortunately the accident has been attended with loss of life, men having been caught in the ballast tanks by the inflowing water and drowned at their work.

But the most remarkable thing about this unfortunate business is the coincidence. That two liners should have sunk, and that with loss of life whilst coaling at opposite sides of the world within recent years would, itself, be remarkable enough. But that both these vessels should have been under one flag, and that out of a fleet which, though important from the character of its ships and from their size and accommodation, is not numerically large, is more than extraordinary. It seems to suggest that at the inquiry which will no doubt be held, we shall hear something as to the coaling practice of the line, and may find that this differs in some important respects from that of other well-known companies.

The Old Holyhead Mail Boats,

having had their names as well as their occupation taken from them by the new twin-screw Laird-built vessels, are now placed in the hands of Messrs. Kellock & Company for sale, as they come off their station, and I understand that they will very soon find purchasers.

Blockade Running.

A very interesting book has been written by a Mr. Taylor, of Liverpool, a gentleman who was engaged in the serious and exciting work of running in and out of the Southern ports during the American Civil War. Steam was young in those days, and the great army of tramps had not yet appeared on the scene. Not that tramps would have been much use for blockade running. Speed and shallow draught were necessary to success. But the development of the Channel steamer had not got very far in those days either—certainly not so far in numbers as to-day. And so very few vessels were available for the work, and those which were first chosen were, in many cases, quite unsuitable. The risks of capture were known to be vast, and accordingly owners thought that any worn out old craft was good enough to be taken as the lawful prize of the Federal navy. It took some time and much bitter experience to show that though the risks were great, the reward of success was proportionately magnificent, and that the better the boat was the more likely she was to carry out her task successfully and to earn the owners the reward they aimed at. The original old vessels were not too seaworthy, they were loaded to a depth which nowadays would not be permitted, for freight in those days was some £70 a ton, and every extra pound carried was worth a little extra risk. The men who manned them and took the risk of going to pieces on the unlighted American coast or being sunk by the fire of a Federal cruiser, or, if they escaped the pistols of Federal seamen, of languishing in a Northern gaol, did not mind the perils of the sea from starting a little too deep, or before the vessels had had their decks properly caulked. What they did object to was a vessel with unreliable machinery, which might fail them at the moment when the spur was applied and the supreme effort demanded. The nerve of no man would stand the dread of being left in the lurch when making his final dash for success, through faulty machinery. But the book is interesting because it contains so much of actual history concerning these exciting times, because it tells so much of the commercial and social life of the day on both sides of the Atlantic, and lastly, and not of less importance, because it throws so much light on the question of blockake running in the future. Whenever there is a great naval war blockade running is certain to be again a profitable and an important field for the employment of capital and young blood. But we cannot but think that the conditions will be far more arduous than they were thirty years ago. The question of the lessons to be learnt in this national aspect from Mr. Taylor's book are not only discussed by himself in the body of the work, but also by "another hand"—as the old authors phrased it—in the preface. I do not by any means endorse their views or opinions; but we must know, of our own knowledge, that if a far better class of blockade runners is available for the merchant who wishes to evade a blockade, the blockading warships are nowadays armed and engined in a manner undreamt of in the sixties. Heavy rapid-firing guns of vastly improved accuracy are carried on all modern cruisers. Speed and power to keep the sea are largely increased, whilst the search-light will at once dazzle and show up the would-be forcer of the blockade. Above all, there are now in attendance on every fleet a whole army flotilla of torpedo vessels, and it may well be that in cases where a blockading squadron has a base in the neighbourhood there may be vessels of the destroyer type who can steam anything up to seven knots beyond the speed of any light-draught merchantman. But this does not really concern the book. The interest is very real and human. Moreover, to those of my readers who visit Liverpool it will be possible to see models of some of the actual vessels which were engaged in this stirring game. At Messrs. C. W. Kellock & Company's office—and it was the mention of their name that made me think of the book—I saw, when in Liverpool at the end of November, several most interesting models, amongst others that of the famous *Banshee No.* 2. The model shows a very fine-lined paddle-boat with a good carrying power, but obviously very light draught. She was a vessel in every way connected with the Mersey. She was Liverpool owned and Liverpool built, having been turned out, as Messrs. Kellock's books show, under their supervision, from the yard of Messrs. Jones, Quiggin, & Company.

The Collision in the St. Lawrence.

The Admiralty Court was occupied during nearly four days in the month of December in the investigation of the circumstances attending the collision between the Dominion liner *Vancouver* and the Beaver liner *Lake Ontario*, off Cock Point, in the St. Lawrence, in August. With the actual circumstances attending the collision we have nothing to do here. Nor does the apportionment of blame for what happened concern us at all. But there is one point which should certainly not be lost sight of by the shipbuilding and designing professions. The *Vancouver* was fully laden and drawing something like 25 ft. forward. She was the bigger vessel of the two, displacing at the draught named upwards of 9,000 tons. The *Lake Ontario* was only drawing 19 ft. forward and was displacing only two-thirds the amount of the colliding vessel. The Court found that the Dominion liner was moving at a speed of not less than eight knots just previous to the collision, whilst the Beaver liner was proceeding much more slowly. The two ships met end on. The damage respectively sustained by the two vessels was most remarkable, and quite contrary to what one would have expected. It would have been said that the heavier vessel, moving faster, would have sustained the less damage. Yet, in the result, the bows of the *Vancouver* were wiped out for some 25 ft. of her length as far down as the keel-line of the *Lake Ontario*, whilst she also shipped large quantities of water. The Beaver liner, on the other hand, had her damage confined to parts above the water-line and did not make any water at all. The reason for this unexpected result was the fact that whereas the *Vancouver* had a straight stem the *Lake Ontario* has a fiddle-bow, and she owed her smaller damage to that fact.

An Almanac.

The almanac issued by the White Star Company changed its character in its 1896 issue. Instead of a card calendar being issued for last year with an etching of one of their liners from the needle of the well-known sea painter, Mr. W. L. Wyllie, A.R.A., as had been done for several years, a case-calendar with a separate card for each month was presented to their friends. As I remarked at the time, these little pictures represented exteriors and interiors of their vessels, and was of considerable interest to those who follow the material of our great merchant fleets, besides being of much artistic merit. This year the line has actually succeeded in improving on the idea it put forward last year. It still has the card calendar in its real Russian leather case, but the pictures are of a somewhat different class whilst the execution is, if possible, more delicate and artistic than before. The subjects now presented are connected with the history of the Line, and include a view of the first White Star boat at Queenstown a quarter of a century ago, the rescue by the *Britannic* in mid-Atlantic, the New Canada dock entrance and the rare sight of the *Majestic* and *Britannic* together at the riverside stage at Liverpool.

Whilst speaking of this publication I may remind readers that the picture for the closing month of the present year was that of the four-masted ship *California*, just sold out of the service. She was a vessel, which, remarkable for herself, had the further distinction of being the last vessel of the White Star sailing fleet. This, as is generally known, was a far older institution than the steam fleet, and made its reputation in the old days of the Australian clipper ships, and of the gold diggers' rush to Australia.

I may mention too in this connection that the new White Star boat, nearly finished at Belfast for the New Zealand service, is to be named *Delphic*. She will be a greater and even more luxurious vessel than the *Gothic*, hitherto the finest vessel in her trade.

The Canadian Atlantic Service.

Messrs. Allan & Co. have ordered a vessel of upwards of 8,000 tons from the Belfast firm of Workman, Clark & Co. But I do not think this order has anything to do with the preparations for the fast service to our nearest colony. This vessel is more likely to be required for the firm's general trade.

As to the fast service itself, necessary as that is to the Colony and to the Empire, it seems to be hung up for a time largely owing to the jealousies of the different ports on either side of the Atlantic. Milford, Southampton, and Greenock all want to wrest the honour (and advantage) of being the terminal port of the new line from Liverpool. Then Mr. Sandford Fleming, who is a railroad expert and not a shipping authority, has rushed in with a proposal to make Loch Ryan the calling port instead of Moville. And things on the other side are nearly as bad. There are some who talk of the alleged "dangers of the St. Lawrence," and try to make the terminal port for the whole of the year to be some place on the Newfoundland or Nova Scotia sea-board. The result is that while all are anxious to see the preliminaries settled and the line inaugurated, the whole thing is hung up, and the object of all frustrated by these constant red herrings being drawn across the path of progress.

The Ignorance of the Daily Press.

Earlier in these Notes I have spoken of the mishap to the *Oratava*. It was only natural perhaps that the ignorant should take the opportunity to bray. Still they brayed painfully loud, and there was no mistaking the sound. The first intimation was accompanied by a note in many London dailies to the effect that the disaster was a parallel to that which befell the *Orient* of the same line in Sydney Harbour some fifteen years ago. They may be forgiven for confusing the *Orient* with her almost sister the *Austral*. But can they explain what they meant by the comment, "The *Orient*, though long ago outbuilt, is still one of the finest vessels in the Orient fleet?" If she is long ago outbuilt she is no longer one of the finest vessels.

An evening paper, however, capped this display of ignorance regarding the merchant marine. It spoke of the Pacific Steam Navigation Company and of the large number of vessels—some twenty-one I think—which that company has recently added to its fleet list. But it spoke of the company as "the Pacific Steam Navigation Company, or, as it is more familiarly known, the Orient Line." Why does not a paper which makes itself acquainted with every detail regarding every Queen's ship we have, take the trouble to know something about the great mail steamers (and their owners) which are at once England's pride and one of the reasons why Queen's ships are vital to our country's welfare.

New York Mails.

Further facilities for the rapid distribution of the European mails on their debarkation at New York are now being prepared. We have seen in this column how tugs were provided on which the sorting of the bags for the different lines of railroad was carried out as they were taken up the bay. The paper economy of this move has been found to be of such practical value that a special vessel is to be provided for the service, and when she comes on the scene with her arrangements specially designed for the work of sorting, still further saving of time is expected to be effected.

The amount of mail matter to be dealt with ever grows as the years pass on, though the number of British bottoms on the Atlantic, in which mails are and can be carried, ever tends downwards owing to the suicidal and repressive policy followed by our own Government what time the foreign States all see the advantages of subsiziding their fast mail boats. The *Teutonic* leaving Queenstown on the 18th December with the Christmas American mail broke the record for number of bags, including even that attained when a vessel has carried her own mail and that which should have gone forward by a vessel which has put back disabled. She had no less than 1,840 sacks.

The Port of the Future.

Unhappy Southampton! We hear little blowing its own trumpet even from the so-called port of the future itself these days. And the keeping of silence is about the only wise thing Southampton can do. It cannot for all its fascination charm back P. & O. to its port, and as will be remembered, it last year lost the homeward call of the Hamburg-American express boats which took Plymouth in its place, and so far seemed satisfied with it in spite of the sneers of the discarded harbour. Now a worse blow is about to fall. Plymouth is to be recognised as the first homeward port in the English Channel by North German Lloyd, so long faithful to the Solent. North German Lloyd were first in the field at Southampton, and it was their adherence that showed first the Hamburg Line and then the American Line that the place was at all commercially possible. The arrangements will not be complete for some months, so that Southampton may still hope that the blow may be averted.

ADJUNCTS FOR WATER GAUGES.

MESSRS. WALLACH BROS., of 57, Gracechurch Street, London, are bringing out two new inventions (relating to water-gauges) for the protection and safety of men employed in boiler-rooms, etc. The one is a luminous gauge glass reflector, which has for its object to clearly indicate the exact level of the water in a gauge glass, either by day or by night; the other is a protective shield for gauge glasses, composed of a combination of stout wire and toughened glass.

As these inventions will no doubt be of interest to our readers, we have pleasure in describing and illustrating them. The luminous gauge glass reflector, which is entitled the "Ever Trusty," is illustrated in Figs. 1 and 2. The reflector is fixed behind the gauge glass and is perforated throughout its entire length with rows of round holes, usually three in a row, of which those that are seen through the portion of the gauge glass filled with water appear to converge, each row of three thus becoming one narrow elliptical hole horizontally disposed; on the other hand, those holes that are seen through the upper portion of the glass where there is no water are not affected, and the observer is thus enabled, momentarily and unmistakably, to see whether the water is at the proper height in the gauge glass. The distinction between the two parts of the tube is very sharp, the lower part in the water space appearing as a series of elliptical holes superposed, and the upper part in the steam space as a number of rows of round holes. Two kinds of reflectors are made, viz.:—Firstly, plain enamelled. and secondly, reflectors prepared with luminous paint, the latter being equally effective for use by day or by night, or in dark boiler-rooms. It is necessary, of course, to expose the luminous reflectors every day to day or artificial light, to enable them to absorb sufficient luminosity, the duration of which latter will be within a reasonable range in proportion to the length of time the exposure lasts. The reflectors are made of strong metal, and are fixed to the gauge glasses by means of a spring clip or by wire, and the proper distance between the reflector and the gauge glass will vary from $\frac{1}{8}$ in. to $\frac{3}{16}$ in., according to the thickness and diameter of the gauge glasses.

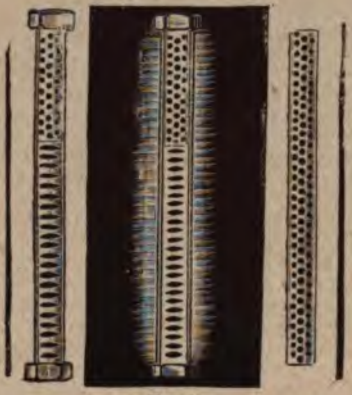


FIG. 1.

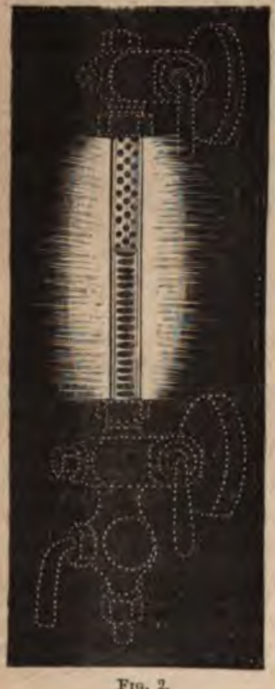


FIG. 2.

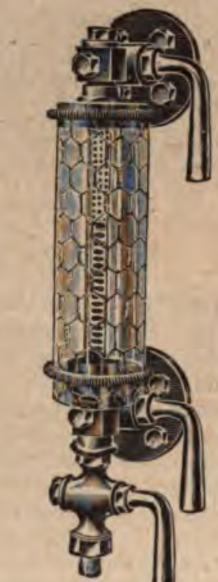


FIG. 3.

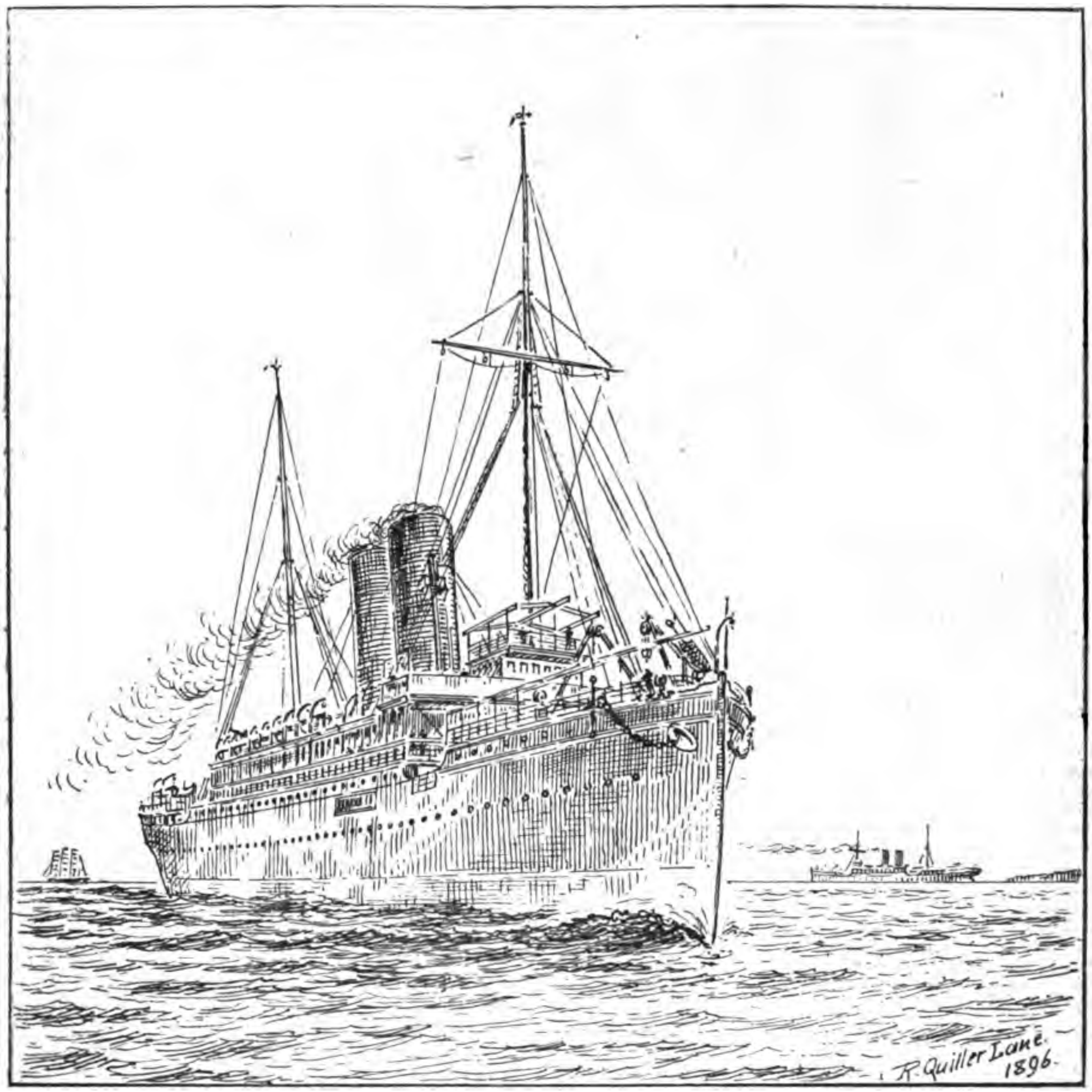
In Fig. 3 we illustrate the patent gauge glass protector, which is made by a patent process from specially toughened glass moulded on wire netting, which is thus embedded in the centre. As seen in section, it is of horse-shoe shape, which is considered to be the most suitable for the purpose.

We understand that this appliance has been subjected to tests of the severest character. In some cases the protectors were purposely damaged, and even then so great was the strength of the toughened glass, and so extraordinary the power with which it was held together by the embedded wire, that they successfully withstood an explosion producing a pressure of 440 lbs. per square inch, and effectually prevented the splinters of the gauge glass from being thrown about. The method of attaching the patent protector to the gauge glass is by two closely coiled spiral springs, which, passing round the protector are fastened to clamps connected by a rod, and fitted closely to two of the sides of the upper and lower hexagonal nuts respectively. This arrangement, it is claimed, not only keeps the protector firmly in position, but also acts as a kind of buffer, as, should a gauge glass burst, the protector will yield through the stretching of the springs, so as to minimize the force of the shock. This device is transparent and easily cleaned, and can be fitted to existing fittings with great facility and simplicity.

THE PORT OF SUNDERLAND.

THE Wear Commissioners have lately issued a book of quite a unique character. The object of the work is, to show in a brief and convenient form, the exceptional advantages possessed by Sunderland as a shipping centre. In the compilation of particulars it seems clear that nothing has been omitted which could be, in the least degree, useful or interesting to the large circle for whose special behoof the work was undertaken; while even Sunderland-born people who take the trouble to scan its pages, will be surprised to find how thoroughly up to date are the shipping accessories of their port, and how strong its claims are to be regarded as among the first—in point of accessibility and general convenience—in the kingdom. Not many people know, for instance, that in the case of the Sunderland docks, ingress and egress are possible at almost all conditions of the tide, and that a vessel can reach the open sea in less than ten minutes from leaving the mooring place. Neither is it commonly known that vessels can be loaded at the high level coal spouts at the rate of 6,000 tons in 24 hours, and that by means of the powerful pumping plant recently put down in connection with the graving docks, the latter can be pumped out in from 30 to 50 minutes, so that a vessel can be docked, and left dry, within the hour. In addition to the foregoing and a number of other interesting particulars, the letterpress comprises full information respecting rates, duties, tolls, and charges, including those for trimming, pilotage, and occupation of the graving docks. The work is embellished with 8 full-page illustrations on fine paper, and two large folding maps. The illustrations, which are admirably executed, represent various aspects of the docks and their surroundings, including the fish quay at the South Outlet; some of the more important coal staiths; the chain-testing works; the Laing warehouse and large masting shears; the graving docks, with vessels under repair; the gas-engine pumping plant, &c. The larger of the two maps is a representation of the harbour and docks, and is done in effective colouring, showing at a glance all features of interest, among which are the old and new piers, the entrances to the docks, and the sheltered area—123 acres in extent—between the new piers, which will be provided when the latter are completed The smaller map is a representation of a large part of the Durham coalfield, and is neatly printed in blue and red tints. The compilation, taken as a whole, reflects the highest credit on those to whom its preparation was entrusted,

and its distribution among commercial communities at home and abroad cannot fail to result in advantage to the trade of the port. The book is enclosed in a handsome cover, in keeping with the superior style in which the work of printing and illustrating has been executed, and is certain to prove of great value to shipowners and others who are in any way connected with, or interested in shipping.


R. Quiller Lane. 1896.

THE NEW P. & O. LINER "CHINA."

THE NEW P. & O. LINER "CHINA."

THIS fine ship, of which we have pleasure in giving a drawing, showing her exactly as she appeared a day or two before leaving Belfast for London—(the smaller vessel in the distance may be taken as her appearance "broadside on")—is the latest addition to this famous fleet. She has lately been completed by her builders, Messrs. Harland & Wolff, and sailed about the 18th ult. for her first voyage to Australia. She is the fifth vessel built by Harland & Wolff for this company, the others being the *Shannon*, *Rosetta*, *Oceana*, and *Arcadia*. The *China* is 496 ft. long; 54 ft. beam; and 37 ft. 6 in. deep; with a registered tonnage of over 8,000 tons.

She is propelled by a single screw, driven by a set of triple-expansion engines of 7,500 I.H.P. She will be able to accommodate about 500 first and second-class passengers. The saloon is placed amidships and is carried out in white and gold. The library and music room is immediately above, executed in African mahogany beautifully inlaid, surmounted by a very handsome skylight in richly ornamented stained glass. The smoking-room is at the after end of the same deck. The second-class passengers have also been well provided for in this respect, and the ship is lighted throughout by electricity.

She is provided with numerous hydraulic cranes for the handling of cargo, and is fitted out as a first-class mail and passenger steamer.

NAVAL MATTERS—PAST AND PROSPECTIVE

(*From our own Correspondents at home and abroad.*)

THE position of the engineer on board a warship relatively to that of the other officers has been considerably discussed of late. There can be no question that it is a subject which needs a good deal of looking into and one that will well repay study. At the present time in the two English speaking Governments of the United States and Great Britain, respectively, there is a considerable amount of dissatisfaction felt among the officers who form that highly important branch. In this country, owing to the dissimilar conditions which prevail, the controversy has not created anything like the same attention at the hands of the public, nor anything like the same amount of rancour in those affected, as have been characteristic of the agitation in America. Speaking of the engineers of the Royal Navy as a whole or as a body, it cannot be said that they have been vastly dissatisfied with their position. They wanted something more tangible. They were fairly well satisfied with the fact that they were no longer looked upon as a race apart, their status was fully recognised, and they hankered very little after glory, gold lace and extra titles, all of which involved extra expense. What they wanted was more pay. We are speaking of but a few years ago. To-day the situation is slightly changed, and it is owing no doubt to the general improvement intellectually and educationally of the whole class. There are naval engineers to-day who feel most keenly certain disabilities and disadvantages in their position, and they regard with jealous eyes the very different position of the engineer ashore and afloat.

Engineers in Ships of War.

What the engineer claims for himself and that which is claimed for him by others, are two very different matters. So far as we understand it, the Royal Naval engineer asks first that his pay and financial prospects should be no worse than those of the officers of the other civil departments on board ship. He feels also that in regard to the discipline of engine room and stokehole, he should have larger executive status, and in order that his position should be fully recognised as that of an officer by people on shore, he wishes to be called by the titles which distinguish alone the combative branch. But in the United States it is apparent that the backers of the engineers have gone a good deal beyond this, and there are signs of the same thing in our own country. The other day Sir Edwyn Sandys Dawes delivered an interesting presidential address to the Institute of Marine Engineers, in which he dwelt upon the new importance of the engineer in modern warships, which he properly described as masses of machinery. He said, "In emergencies success depended not only on the courage and efficiency of those on deck, but upon those below and unseen, who had with a cool head and a strong heart to remain at their posts obediently and intelligently, regulating and controlling the complicated machinery upon which the movements of the ship depended." That is a view from which nobody can dissent. But, commenting upon these words, a writer in the *Pall Mall Gazette* declares that "the marine engineer is to-day more important than any deck officer." Upon this point let us see what some American officers have to say.

The Engineer in Naval Warfare.

To the December number of the *North American Review* several officers of experience and authority contribute a symposium, which is in effect an answer to a similar series written by engineers in the same magazine in May last. These officers are Admiral Walker, Captain Mahan, Captain Evans and Lieutenant Staunton. They are all agreed upon the increased importance of the engineer, and recognise that the efficiency of the modern warship largely depends upon the manner in which he carries out his duties. But they insist that it is absurd to say that the engineer is of more importance than the deck officer, for it is the latter who employs and directs the forces of the ship. "The man," says Admiral Walker, "who takes no initiative, determines no issues, however intelligent and trustworthy, plays a subordinate part, and such a man is the naval engineer in battle." He argues that the effective employment of the ship must be wholly dependent upon the qualities of our captains or upon the senior executive, who may be called upon at any moment by the loss of his superiors to direct the ship and the issue of the fight. "No such duty does devolve or can devolve upon the engineer. His duty remains the same and remains subordinate throughout all the phases of the battle. His position in the naval organisation is fixed and limited by these conditions." Captain Mahan and the other officers deal with other questions raised and claims made in the articles to which they reply. The subject is particularly interesting and should be read very widely.

Portsmouth Dockyard.

At this yard the most important item has been the commissioning trial of the *Prince George*. Although a gale was blowing at the time, she worked up to 9,800 H.P., with a speed of about 16 knots and in every way gave satisfaction. Another vessel to make her commissioning trial was the cruiser *Indefatigable*, which with 6,500 H.P. obtained a speed of 18 knots. We are expecting shortly to see a trial of the destroyer *Surly*, which has been fitted for the use of oil fuel, and on January 6th the *Terrible* will recommence her runs. Tenders have at last been invited for the reconstruction of the North Royal jetty, but it is not expected that the work will be commenced before February. Good progress is being made with the Fountain Lake jetty, and when these two are finished the yard will be well provided in this respect. Another impending change is the transfer of the Anglesea barracks from the War Office to the Navy, when, as the total site to be acquired by the Admiralty exceeds 60 acres, there should be room for a fine naval depot and plenty of ground for recreation and drill. The launch of the *Gladiator* by Miss Goschen, a daughter of the First Lord was very successful, and now we are looking forward to beginning some new ships. The completion of the two new docks is an event which I cannot pass over, but in connection with this important matter it is a pity that steps are not taken to widen the caisson between the rigging and the repairing basins, so a to match those opening into the Fountain Lake and the newest of the docks. The width of the opening into the dock is considerably over 90 ft., whereas that of the caisson is only about 80 ft. This is a matter to which attention will no doubt be given in next year's programme. The Portsmouth division of the ships of the Channel squadron have been here for refit and this with the work in hand has kept us employed. We are no looking forward to renewed activity in building in connection with the *Canopus*.

A Story of Naval Adminstration.

An interesting little book is that which Mr. Francis G. Burton has just written under the title of "The Naval Engineer and the Command of the Sea." It is in the form of a personal narrative of adventures in a series of imaginary war, which arise between this country and France and the United States. The reader cannot fail to follow with much interest the adventures of the hero who goes to sea as an engineer and takes part in most of the actions of the war. But this is merely a peg on which to hang a statement of the grievances of the engineers, and a criticism of Admiralty administration. "There is," says Mr. Burton, "a deep feeling of discontent throughout all the branches of the naval engine-room staff which threatens serious disaster, while in addition it is absolutely certain that at the present moment we have neither engineer officers nor artificers sufficient for the ships we have ready for commission, and equally evident that we cannot under the present regulations obtain the number required." Naturally Mr. Burton sets matters out in the worst possible light. At the same time it is obvious that the writer has carefully studied his subject, and has here provided an earnest and carefully thought out contribution to the discussion of an important subject; the story of the genesis of wire guns does not seem altogether *apropos*, but at the same time is very instructive. The work is dedicated by permission to Lord Charles Beresford.

The Royal United Service Institution.

The election of Staff Engineer T. J. Haddy, R.N., to fill the vacancy on the council of the Royal United Service Institution caused by the death of Rear-Admiral Walter Stewart, is not only a compliment to a very talented officer, but also to the important branch of the naval service to which he belongs. It is entirely characteristic of all institutions conducted by naval officers in the present day that every effort should be made to make them thoroughly representative of the Navy. Major Gen. Lord Methuen is the chairman of this council, and amongst its members may be mentioned Admiral Bowden Smith, Sir William White and Lieut. Col. Edye, Royal Marine Light

Infantry. Staff-Engineer T. J. Haddy has long been known as an authority upon torpedoes, and he is now engaged in assisting to organize a torpedo establishment at Chatham on the lines of the one at Portsmouth, of which he was for some years in charge. He is one of the best linguists in the Navy, and the numerous articles which he has at times translated for the Journal of the Institution, demonstrate his fluency in French, German and Italian. Among these papers may be mentioned one on "Electric Ventilators," by Dr. Pasqualini, from the *Revista Maritima*, and on account of the electrical fittings of the Bouvines by Lieut. Pratt, from the *Revue Maratime et Coloniale.*

Chatham Dockyard.

The *Howe*, which has come here from the Mediterranean, where she was relieved by the *Revenge*, has been paid off all standing, and she has been recommissioned to replace the *Warspite*, as port-guard ship at Queenstown. She will then be transferred from Chatham to Devonport for manning and repairs. The *Warspite* will be attached to this yard in her place, and it is intended she shall have a thorough refit and repair in readiness for foreign service. Several ships of the Channel Squadron and the *Northampton* training ship have been here lately to give Christmas leave, but they have not required much work from the yard hands. The *Endymion* has also arrived with the paid-off crews of the *Polyphemus* and *Imogene*. The *Leander* is in the repairing basin completing her refit and the trials of her new gun-mounts will be made at an early date. The old pattern guns of the *Arethusa* have been sent to Woolwich to be converted into quick-firers, and it is expected that the *Audacious* will be taken in hand early next year with a view to the modernising of her armament. Although the work of laying down the *Goliath* has not yet taken place a good deal of preparation for her construction is in hand and rapid progress will be made with her, since the blocks upon which she is to be built are ready. It is expected that her keel will be laid on January 3rd, and large consignments of material are already on the spot. The *Minerva* has been passed into the Fleet Reserve. The *Vindictive* has had her stem put into position and her stern and rudder post fitted. Some little delay has taken place in connection with the *Illustrious* by the non-delivery to time of some of her armour plates. On the whole, however, I have to report a contraction of the activity which has characterised this yard during the year.

The late Chief Engineer of the "Blake."

The Admiralty were not long before their action expressed their feelings in regard to the result of the *Blake* court-martial. The appointment of Fleet-Engineer Burner to H.M.S. *Mercury* can only be regarded as intended to demonstrate that although the Admiralty have no intention of overriding the finding of the court-martial, and indeed may coincide entirely with its finding, still they do not consider that it should be punished otherwise than by a mild reprimand. It will be remembered that he was found partly guilty of negligence of one of the charges framed against him. That he should have been appointed to another ship in this prompt manner is pretty conclusive proof that the Admiralty held him to be partly innocent also. As a result of this appointment Fleet-Engineer Burner will suffer slightly for a time in pocket because the engines of the *Mercury* are not so powerful as those of the *Blake*, but then he would have suffered much more severely had he been kept on half-pay, as might have been the case had the sentence of the court-martial been carried out to the letter instead of to the spirit only. In some quarters there has been expressed the opinion that Fleet-Engineer Burner would have come off more easily had he been tried by a court composed of engineer officers. We see no grounds for believing this. It is not considered necessary that women should be tried by a jury of matrons or that the Judges of the Admiralty Court should be experienced seamen. Only the other day a question bearing on the manner in which a doctor diagnosed a case was settled by a judge and jury which was not composed of medical men. It is considered sufficient that experts should give evidence as was done in the case of the *Blake* court martial, and it is improbable that any advantages would arise if a change in court-martial procedure was made in the direction suggested than if matters are left as they are.

The Nation's Food Supply.

A very interesting question has been raised by a correspondence in the *Times* on the subject of food supply in time of war. A Mr. Robert Yerburgh asks the question, "Can naval supremacy wholly safeguard this over-populated country against a perilous rise in the price of food on the outbreak of war?" He does not believe that it would do so. At the same time, while it advocates a national reserve of wheat and other bread-stuffs as the only possible means of averting a possible sudden rise in prices, but does not hold that any such provision would justify us in decreasing our naval expenditure. An expert in the grain trade believes that the price of wheat would be doubled on the firing of the first gun. Mr. Yerburgh quotes on trustworthy authority the statement that six out of every seven loaves sold in this country are made from imported materials. Two years ago Russia controlled no less than 60 per cent. of the total amount of wheat we exported. "What then is more likely," says Mr. Yerburgh, "than that in the possible event of war with Russia and France food stuffs would be declared contraband of war, and a sudden rise would take place in the prices seriously affecting the working and other classes all over the country?" He therefore advocates the establishment of a Government reserve of wheat. There appears to be a disinclination on the part of the authorities to consider this question, the letter of Mr. Yerburgh indeed has called forth nothing in the shape of a serious reply. While we feel assured that anything short of absolute naval supremacy must result inevitably in that sudden rise to which Mr. Yerburgh refers, it does seem that this suggestion, which would not be very costly, should receive due consideration.

Devonport Dockyard.

It would almost appear as if the *Renown* was looked upon as an experimental ship, she has been fitted with so many new arrangements of one sort and another. Her underwater fittings are to be made of aluminium copper in order that it may be tested as a non-corrosive agent. In the same ship refrigeratory chambers have been fitted so that fresh meat and vegetables can be preserved as they are on mail steamers, and it is intended to supply the ships of the company with a change of fresh meat carried in this way. Much new plant is being supplied at Keyham. Amongst other matters a set of powerful shear legs on the jetty, which when it is extended will be capable of berthing the longest ship afloat. Recently the lighting of the dockyard has attracted some attention, and there can be no doubt that either the present system should be made more efficient or that the electric light should be laid on. The western division of the Channel Squadron was in port at Christmas time, but otherwise we have not had a large number of commissioned ships. The launch of the *Furious* was in every way successful, but its picturesqueness was somewhat spoilt by the weather, heavy rain and south-westerly gale being concomitants of the function. Until a new ship is taken in hand we have nothing here on the stocks. The building of the *Ocean* is to take place in an open slip instead of in a shed, the first time that such a thing has taken place at Devonport yard. The next ship to be commissioned here will be the *Amphion*.

The Navy Estimates in France.

During the past month a strong attempt has been made in France to stir up the country on the subject of an increase in the French Navy. M. Lockroy, the late Minister of Marine, has not only written an interesting pamphlet pointing out what he considers to be necessary requirements, but the matter has been taken up in the Press and in Parliament. In some sense it may be that the agitation was an attack upon the Government, but there is more in it than this is very clear. The establishment of a Navy League upon the pattern of our own has been seriously proposed. The discussion in the Chamber was interesting, particularly the contribution of M. Delcasse, at one time the Minister of Marine. In discussing the value of the navy compared with our own he declared there can be no question of maintaining a successful rivalry with us. But he would like to see more armoured cruisers of about 8,000 or 9,000 tons, with a speed of 25 knots and great range of action, added to the fleet. M. Pelletan made a clever and humorous speech declaring that there had been no progress in the French Navy since the war with Russia in 1854—except in the matter of expense. M. Lockroy's proposal for opening a special credit for shipbuilding and carrying out certain requirements was rejected by 335 to 73 votes, but the Minister of Marine promised to accelerate the speed of shipbuilding, and to elaborate a new programme which should be communicated to the Chamber without delay. We must expect, therefore, that the French Naval Estimates will soon show an increase.

Naval Expenditure in Germany and Italy.

Side by side with the agitation in France there has been a similar movement in Germany for the purpose of directing public opinion towards the increase of the Imperial Navy. The estimates recently presented will very likely be shorn of their present proportions, and doubtless this is partly the cause of the activity of the writers on naval matters. Major Otto Wachs bases his proclamations on the Emperor's proclamation that Germany had become a world Empire, and on this ground he demands a larger increase of the fleet. Much the same thing is occurring in Italy, where the naval estimates have been under discussion. These have been considerably cut down, and although extraordinary credits for the purpose of naval construction have been annually voted, it has not been possible to carry out the programme adopted in 1887, and the Minister of Marine declares that the fleet now falls short of the standard then set up by no less than 89 vessels, of which 28 are battleships and cruisers. An improvement in the national finances has made it possible, he said, to add to the navy estimates, and if he finds the support that he asks for, there will be renewed activity in Italian dockyards in 1897-98.

Sheerness Dockyard.

The launch of the *Proserpine* has been the principal event at this yard, she being put into the water exactly nine months and three days from the date of laying down. Preparations have been made for beginning on the same slip the *Pomone*, the third of the *Pelorus* type of cruiser to be built here. Nothing has yet been decided about the *Dolphin*, and it is generally supposed that the *Swallow* has been superseded for her in this year's programme. It may be that like her sister the *Wanderer*, she will be converted into a sailing vessel, and used as a boys' training ship. By the end of January the *Egeria* will have completed her refit and be commissioned for surveying service. It is not yet known whether she will hoist the pennant here or at Chatham. December 31st was the day laid down for the completion of the *Pelorus*, but it is fully expected that this will take place at least a fortnight later. The contractor's workmen have left her, and she is generally looked upon as one of the most satisfactory examples of recent construction. The *Wrangler* gunboat has been completed for harbour defence. It is intended that she shall form part of the boom which is to be constructed in Southampton Water on similar lines to those in the Medway and at Portsmouth. Whether the *Wrangler* will be sent to Southampton for the present does not appear certain, but she is quite ready, and it would appear wiser to have her on the spot than to leave her here. We have a number of destroyers in hand for repairs and several other small items, including the *Wye*, which has now left us, and in her place the ships of the fishery protection flotilla have arrived and will require minor repairs.

The Russian Fleet.

In Russia many developments in regard to naval matters make themselves apparent in a manner which must necessarily affect the policy of this country. The rapid extension of the Russian Fleet is obvious to all; but, as is well known, the Black Sea Squadron, one of its most important factors, is rendered partly ineffective by being locked up. That Russia looks forward to the ultimate freeing of the Dardenelles there can be no doubt, and probably she hopes to establish a base in the Mediterranean. In more northern waters an attempt has been made to give the Baltic Squadron an ice-free base at Libau, but this is not yet opened. A similar advantage has been long sought for on the Pacific, where, in spite of its many advantages. Vladivostok is not an ideal naval port. Russia also intends to establish an ice-free port on the White Sea, in direct railway communication with St. Petersburg. Meanwhile, in another direction a number of experiments have been made in the fleet for making use of the oil known as "masut," or naptha, for stoking purposes. As far back as October last a torpedo-boat, having been altered for the purpose, underwent trials before a special commission, and she is now to be taken as a model for other torpedo-boats with locomotive boilers, which are to be fitted for use of liquid fuel. Next year, also, it is intended to build six first-class boats with Du Temple boilers on the tubulous system adapted for oil-stoking. Experiments are also to be made with oil in Yarrow boilers. It is not proposed that coal as a fuel shall be entirely done away with, but the two systems are to be made use of side by side. It is noteworthy that in consequence of the exceedingly bright light emitted during the burning of the "masut," it has been necessary to supply the stokers with coloured glasses.

The Training of Stokers.

Chief Inspector of Machinery Johnson, R.N., has been attracting attention in the *United Service Magazine* to what he terms a weak point in naval administration. His aim is to set forth the dangers of the present system of training stokers for the navy, the chief defect being the imperfect training of the second-class men. Stokers, he reminds us, are entered in the navy without regard to previous experience. In point of fact, some 98 per cent. of them have never seen a boiler. They are selected mainly with a view to physical qualifications, and no one will raise objection to the system so far. But for three months after entering they are instructed in the rudiments of discipline, accustomed to ship routine, and taught a smattering of drill. This period, the chief engineer considers, should be extended to six months, as the health and physique of the recruits is found to improve materially during this preliminary training. It is particularly in regard to the manner in which they spend the subsequent twelve months that objection is raised. During this time they are employed in drawing stores, coaling ships, cleaning machinery, and now and again they go afloat for a steam trial. But they are never taught to stoke even on these last-named occasions, their work solely consisting in trimming coal, which, although it is a part of their future employment, is only a minor part after all. The result of this, in the words of Chief Inspector Johnson, is that "it not unfrequently happens that a stoker recruit is drafted into a sea-going ship as part of her engine-room staff without having ever seen a boiler fire alight or an engine in motion." It is clear from this that the more effective training of our stokers is a subject for careful consideration at the hands of the naval authorities, who would do well to obtain expert opinion and suggestion on the matter.

Pembroke Dockyard.

It is a curious circumstance that in some respects this yard should be ahead of its larger sisters to the eastward. Some time ago a temporary installation of electricity for lighting the fitting shop was carried out, and the result of the experience thus gained has been to convince the authorities of the desirability of more generally utilising the new light, and accordingly three 5,000-candle-power arc lamps have been fitted up in the roadway on both sides of the *Andromeda*, which ship has now nearly completed sheathing. As a result of the fire which occurred on board the *Hannibal* some little time since, special attention has been called to the necessity of taking all precautions to avoid the possibility of its recurrence. For the collection of candle-ends iron boxes have been provided on board each ship, and the removal of shavings and the destruction of oily waste have been particularly enjoined. It is anticipated that immediately after the launch of the *Andromeda* in April next she will be taken to Hobbs Point to receive her machinery and masts, &c. The *Hannibal*, which has been lying there for some time, will by that time have been taken to the new moorings occupied by the *Thunderer*, and this ship will lie further down the Haven. The plan which was suggested for lifting the engines of the *Andromeda* on board without taking her under the shear legs at Hobbs Point seems to have been definitely abandoned. No date has yet been given for the commencement of the *Spartiate*.

Civil and Mechanical Engineers' Society.—On Thursday, December 10th, the members of the Civil and Mechanical Engineers' Society paid a visit, by the kind permission of the directors, to the very interesting shot and lead works of Messrs. Walkers, Parker & Co., Limited, Belvedere Road, Lambeth. The party were conducted over by the engineer, Mr. Darling. The casting of the lead slabs and their conversion under the rolling mills into thin sheets of lead was watched with special interest, together with the different processes used for drawing the lead pipes. The members afterwards visited the shot tower to view the process of shot-making from the commencement to the final packing for export.

BAIRD'S BALANCED SAFETY GEAR FOR BULKHEAD DOORS.

IN the adjoining diagrams we illustrate a novel form of balanced safety gear for bulkhead doors, invented by Mr. R. Baird, of 3, Springfield Lane, Kingston, Glasgow. It will be seen from the illustrations that Fig. 1 is a vertical section of the device taken on the line d d. Fig. 2 is a front elevation showing the gear attached to the bulkhead door B, the lower portion of the device being in section. Fig. 3 is a transverse section on the line A A, showing steadying guides J.

The device consists of a watertight casing L, containing a divided float M, which is connected by a wire rope H, and spindle N, to a pulley K.

Upon the spindle carrying the pulley K is mounted a quadrant G, of larger diameter than the pulley K; the combination forming a pair of differential pulleys.

The bulkhead door B is suspended between steadying guides J, by a wire rope wound round and attached to the quadrant G.

The door and the float balance each other, and to move the door to any position it is only necessary to exert sufficient force to overcome the friction of the axis of the pulleys, and as the leverage given by the differential pulleys is in the ratio of three to one in favour of the door, the latter is moved very easily up and down by hand.

In the casing L non-return valves V are fitted, which open into the casing from each side of the bulkhead C, so that in the event of the flooding of either compartment of the ship, the water enters the casing and reduces the weight of the float by flotation sufficiently to allow the door to close as the water rises, so that when the water reaches the floor W, the door B will be completely closed.

As the door only closes at a speed proportional to

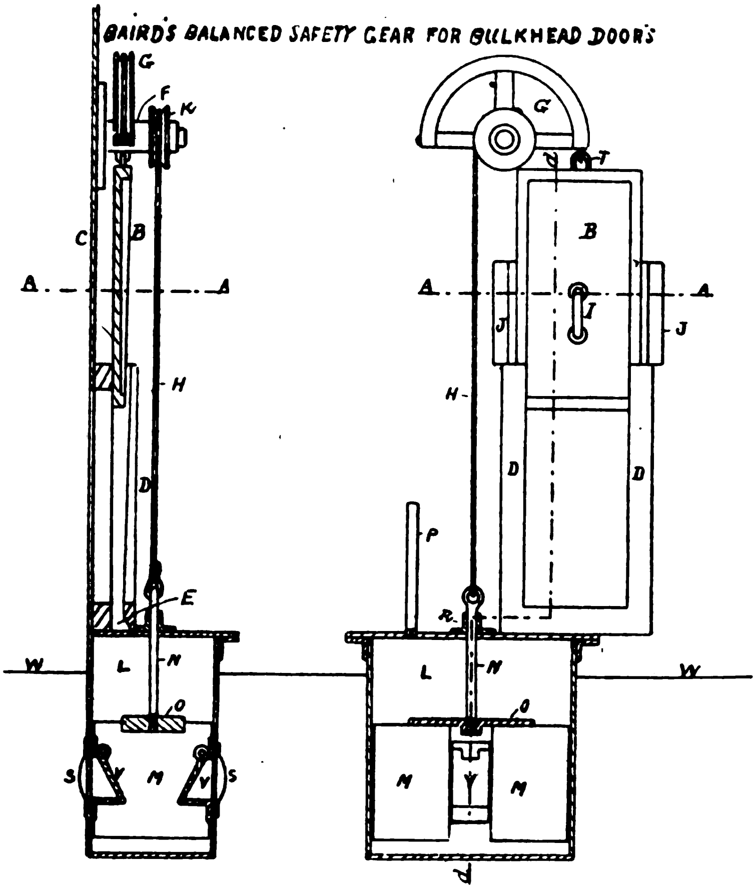


FIG. 1 FIG. 2

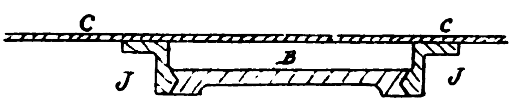


FIG. 3

the rise of the water, there is no danger of anyone being trapped or caught in passing through, and further, the lifting gear being of a flexible nature, admits of the door being easily lifted.

A grating S is fitted to the exterior of the non-returned valves, to prevent the fouling of the valves V or the watertight casing L.

A NEW BOILER AND PIPE COVERING.

THE qualities desirable in an ideal calorifuge are, firstly, high non-conductive properties, to which must be added economy in first cost, durability, cohesion, elasticity, cleanliness, and last but not least, it should contain nothing calculated to injure the plates to which it is applied, or absorb moisture, which would have the same effect. Fine hair felt, although probably the very best non-conducting material applicable in practice becomes in itself a real danger through this last cause.

The sanitary conditions of the engine-rooms and stoke-holds of steamers have long been neglected even by engineers themselves, and as far as temperature is concerned the fault lies perhaps in the excessive cost of good non-conductors and the difficulty of application. In an article in the *Sanitary Institute Journal*, Mr. W. G. Romeril, Associate of the Institute, states that, "little attention appears to be paid to the proper insulation of back ends of boilers, cylinders and steam pipes," and while advocating more air space and ventilation on engine-room platforms, adds "that the careful covering of boilers, pipes, and cylinders with non-conducting material would conduce to lowering the temperature, and also assist in maintaining a high internal temperature with a corresponding saving of fuel. High steam pressures mean a corresponding increase of temperature in the vicinity of boilers, and up to the present time sanitation in these places has been but a secondary consideration."

A new composition, made according to W. G. Jack's patent is being put upon the market by Messrs. Marty & D'Abbadie, of Tonquin, China, under the title of the Revêtement Calorifuge Tonkinois.

The base of this composition, which is found in the rich, but hitherto undeveloped country Tonquin, is, it is stated, one of the most perfect non-conductors yet discovered.

The following advantages are claimed for this composition :—

The efficiency of it as a non-conductor of heat is very high, the thickness of about one inch and a half having been found sufficient to permit the hand to lie on it when laid on a high pressure boiler whilst under steam.

A real economy is effected by its use as the first cost is so low that it saves its value in fuel several times over in the course of a year.

It is very durable, being, like asbestos, nearly indestructible by heat, although it has an efficiency much superior to that mineral, which in itself does not possess much power of preventing radiation, and is not in consequence an efficient boiler covering.

Its cohesive properties are very great: it has been applied as an experiment on a smooth painted vertical bulkhead in a sea-going steamer, where, we understand, it still sticks like glue. It is also exceedingly elastic and gives to the expansion and contraction of long lengths of steam piping without cracking.

It is perfectly clean and innocuous; being neutral, it contains nothing that will injure the metals to which it is applied, and the ease of application will recommend it to everyone. When ready for use it consists of light, feathery flakes mixed in proportion with an elastic cement in powder, likewise a product of Tonquin. It is prepared by the natives, being beaten in mortars until the proper density is arrived at, and afterwards dried in low, flat pans in the heat of the tropical sun. It is then packed in new paper-lined barrels of 2 cwt. each, and is ready for use; the only adjunct required being warm water.

The proprietors of the Revêtement Calorifuge Tonkinois advise that bulkheads and casings of steamers trading to tropical climates be covered internally, with the result that hot alleyways and hold bulkheads (the terror of shippers of perishable goods who regularly mark, "Stow away from boilers"), would be reduced in temperature and the lives of officers off watch, berthed in the alleyways, rendered endurable. Before putting their patent in the market the manufacturers have tested it severely in almost every situation, both ashore and afloat, and consider they are in a position to state authoritatively the merits of the invention.

OBITUARY.

DEATH OF A PROMINENT CLYDE SHIPBUILDER.

THE death of Henry C. Lobnitz, for many years head of the firm of Lobnitz & Co., Limited, engineers and shipbuilders, occurred on the evening of the 18th ult., at his residence, Clarence House, Renfrew. He passed peacefully away at the age of sixty-five years after a very long illness, which was a sad close to his active life.

Born at Fredericia, Denmark, in 1831, Mr. Lobnitz early showed engineering talent. He no doubt inherited this from his family, who were military men in charge of the Danish Royal Arsenals for the manufacture of guns and small arms.

While quite a young man he came to London, and was naturalised a British subject with a view to follow his profession in a larger field. In 1862 he married Miss. C. D. Calder, of Tanderlane, East Lothian.

He worked with the firm of Penn in London, and was with Scott Russell when the *Great Eastern* was built, and, as engineer in one of Her Majesty's ships, he went through the Crimean War. Thereafter he came to the Clyde, and joined in 1857 the engineering and shipbuilding firm of which he later on became the head, then styled James Henderson & Son, Slip Dock, Renfrew.

For the last two years he has been laid aside from business, and his death is widely regretted inside as well as beyond the works of Lobnitz & Co., Limited. His genial presence wil be much missed on the Clyde, where he has been so long well-known.

The Torpedo-boat Destroyer "Entre Rios," the second of the four torpedo-boat destroyers lately built by Messrs. Yarrow & Co., of Poplar, for the Argentine Government, has lately completed her voyage from London to Buenos Ayres, having made the run from St. Vincent to Buenos Ayres, a distance of 3,70 miles, without calling at any port, which is a remarkable performance. No other torpedo-boat destroyer has ever accomplished a journey of this length without coaling. The third boat, the *Misiones*, has arrived at Las Palmas, having successfully encountered the exceptionally severe weather lately prevalent on the coast of Spain.

LIST OF VESSELS LAUNCHED IN 1896.

ENGLISH.

By Allsupp & Co., Ltd., Caledonian Foundry, Strand Road, Preston.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. N.
† Duchess	Steel	Steam	British	144	35
* Perseverance ..	Iron	„	„	212	98
* Vixen	Steel	„	„	114	60
Lord Nelson ..	„	„	„	228	80
Stella	„	Sail	„	30	—
By S. P. Austin & Son, Wear Dockyard, Sunderland.					
† Surf	Steel	Steam	British	1,596	150
† Harbury	„	„	„	1,838	160
† Ludwig	„	„	Foreign	2,820	210
† Harborne ..	„	„	British	1,278	120
† Harpenden ..	„	„	„	3,070	220
By John Blumer & Co., North Dock, Sunderland.					
† No. 130	Steel	Steam	Not sold	2,820	210
† Dunav	„	„	Foreign	1,648	120
† Arranmoor ..	„	„	British	2,427	190
† Dona Amelia ..	„	„	Foreign	2,685	220
† Rookwood ..	„	„	British	1,096	150
† Lockwood.. ..	„	„	„	1,096	150
† Winnie	„	„	„	2,532	210
By R. Craggs & Sons, Middlesbro' and Stockton-on-Tees.					
* Ville de Cayenne	Steel	Steam	Foreign	291	45
* SS. not named ..	„	„	British	300	50
* Ready	„	„	„	250	65
* Rapid	„	S. Tug	„	76	65
* Racer	„	„	„	76	65
† Dagmar	„	Steam	Foreign	1,457	172
† Vidar	„	„	„	1,560	175
† Gunhild	„	„	„	1,532	173
† Gerd	„	„	„	580	75
Princess of Wales	„	Pad'le	British	162	65
† SS. not named	„	Steam	„	300	70
Barge	„	Tow.	Foreign	60	—
4 Vessels	„	Sail	British	ea 300	—
By Edwards & Co., Millwall.					
Nos. 356 to 360 ..	Steel	Barge	Foreign	ea. 30	—
„ 361	„ Cl.	„	British	100	—
„ 362 to 365 ..	„ Spl.	„	„	ea. 30	—
„ 366	„	„	„	10	—
„ 368	„	Dahabeah	Foreign	60	—
* „ 369	„	Steam	„	50	25
‡ „ 370	„	S. Dr'ger	British	40	10
* „ 371	„	Steam	„	120	50
* „ 372 to 377 ..	„	„	Foreign	ea. 30	ea. 20
* „ 378	„	„	„	100	40
„ 386 to 389 ..	„ Spl.	Barge	British	ea. 30	—
By Wm. Doxford & Sons, Ltd., Pallion, Sunderland.					
Algoa	Steel	Steam	British	7,574	600
Selena	„	„	„	3,479	300
Ashmore	„	„	Foreign	3,460	„
Imperialist ..	„	„	British	3,442	„
Bullionist ..	„	„	„	3,435	„
Norman Isles ..	„	„	Foreign	3,454	„
Montgomery ..	„	„	British	3,470	„
Turret Chief ..	„	„	„	1,881	250
Turret Court ..	„	„	„	1,878	„
Castello	„	„	„	3,660	300
Maud Cassel ..	„	„	Foreign	3,800	350
By Irvine & Co., West Hartlepool.					
† Pendaver	Steel	Steam	British	2,679	220
† Lorle	„	„	„	2,685	220
No. 98 & 99 ..	„	Barge	Foreign	ea. 50	—
† Jacob Bright ..	„	Steam	British	2,686	220
By Wm. Pickersgill & Son, Southwick, Sunderland.					
† Otterspool ..	Steel	Steam	British	2878·47	245
† Kendal Castle ..	„	„	„	2884·55	245

* Compound. † Triple. ‡ High Pressure.

By Edwards Bros., North Shields.

Name of Vessel.	Built of	Class	Owners.	G. T. Regis	H.P. N.
† No. 500	Steel	St. Tr.	British	117	40
† „ 514	„	„	„	162	41
† „ 515	„	„	„	118	30
* „ 516	„	S.B'ge	Foreign	550	64
† „ 517	„	St. Tr.	British	118	30
† „ 518	„	„	„	144	50
† „ 519	„	„	„	146	55
† „ 520	„	„	„	145	55
† „ 521	„	„	„	147	50
† „ 522	Iron	„	„	127	40
† „ 523	„	„	„	128	40
† „ 524 to 528 ..	Steel	„	„	ea145	ea. 50
* „ 529	„	S.B'ge	„	130	40
† „ 530	„	St. Tr.	„	146	50
† „ 531 to 535 ..	Iron	„	„	ea144	ea. 45
† „ 536 & 537 ..	Steel	„	„	ea200	ea. 70
† „ 539 & 540 ..	Iron	„	„	ea130	ea. 40
† „ 541 & 542 ..	Steel	„	„	ea140	ea. 40
By R. & H. Green, Blackwall.					
* Duke of Devonshire	Steel	Pad'le	British	257	10.6
Katharine ..	„	Screw	„	70	—
The Governor ..	„	Ligh'r	„	90	—
The Deputy ..	„	„	„	„	—
Councillor ..	„	„	„	„	—
Dongola	„	„	„	„	—
Buxa	„	„	„	„	—
Rema	„	„	„	„	—
Rhin	„	„	Foreign	„	—
Danubio	„	„	„	„	—
By Robert Stephenson & Co., Hebburn-on-Tyne.					
Shadwell	Iron	Sail	British	261	—
Don	„	„	„	245	—
Caisson Gate ..	„	—	„	823	—
2 Dock Gates ..	Steel	—	„	—	—
By Geo. & Thos. Smith, Rye, Sussex.					
Defender	Wood	Sail	British	36·32	—
Three Sarahs ..	„	„	„	20·24	—
A. J. W.	„	„	„	35·97	—
Veda	„	„	„	36 27	—
Three Brothers ..	„	„	„	24·88	—
Meteor	„	„	„	30·33	—
Jimmy Lowther..	„	„	„	30·04	—
By T. G. Tagg & Son, East Molesey, Surrey.					
* Princess Beatrice	Wood	Steam	British	51·77	10
By Craig, Taylor & Co., Thornaby-on-Tees.					
† Prudente de Moraes	Steel	Steam	Foreign	780	100
† Clarence	„	„	British	1,427	130
† Urania	„	„	Foreign	2 115	148
By Williamson & Son, Workington, Cumberland.					
2 Refuse hoppers	—	—	British	ea. 60	—
Water barge ..	—	—	Foreign	40	—
Coal „ ..	—	—	„	200	—
Coasting steamer	—	—	British	532	—
„ „	—	—	„	290	—
9 Barges	—	—	Foreign	1,000	—
By J. Allen & Co., Hamworthy, Poole, Dorset.					
Solace	Wood	Sail	British	16	—
Madge	„	„	„	16	—
By Rennoldson & Son, South Shields.					
Bertha	Steel	Sail	British	200·64	—
Sir Joseph Pease..	Iron	Steam	„	180·12	90
Greenore	Steel	„	„	212·56	70
* Welshman ..	Iron	„	„	55·41	30
† Goole, No. 10 ..	„	„	„	169·43	75
* Jupiter	„	„	„	149 08	90
* Ayr	„	„	„	118·	45

* Compound. † Triple. ‡ High Pressure. *a* Quadruple.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P N.
By J. G. Fay & Co., Ltd., Southampton.					
Dusky Queen ..	Wood	Sail	British	10	—
Queen Hearts ..	,,	,,	,,	5	—
Chairman ..	Composite	,,	,,	175	—
La Fleche ..	,,	,,	,,	107	—
Hadje	Wood	,,	,,	16	—
Sarcelle	,,	,,	,,	8	—
Hulloa	,,	,,	,,	3	—
By Sidney J. Dewdney, Brixham.					
White Rose ..	Wood	Sail	British	49·55	—
Claudine	,,	,,	,,	50·62	—
Rosebud	,,	,,	,,	50·93	—
Jessamine ..	,,	,,	,,	48·70	—
By Chas. Hansen & Sons, West Cowes, Isle of Wight.					
Alruda	Composite	Sail	British	32	—
St. Agnes	,,	,,	,,	60	—
By James Harland & Co., Tranmere.					
Barge	Composite	—	Foreign	abt. 60	—
By James Laing, Deptford Yard, Sunderland.					
Clio	Steel	Steam	—	631	120
Umtali	,,	,,	—	2,627	450
Umvoti	,,	,,	—	2,625	450
Orion	,,	,,	—	628	120
Orthia	,,	,,	—	4,225	400
Sevastopol ..	,,	,,	—	1,329	200
Yalta	,,	,,	—	1,327	200
Novorrossisk ..	,,	,,	—	1,321	200
Batoum	,,	,,	—	1,324	200
Westralia ..	,,	,,	—	2,875	500
Oscar II.	,,	,,	—	3,688	320
By Richardson, Duck & Co., Stockton-on-Tees.					
Dacia	Steel	Steam	Foreign	2,137	218
Parthia	,,	,,	,,	2,731	245
Norden	,,	,,	,,	2,481	245
Nordboen	,,	,,	,,	2,404	245
Kinsale	,,	,,	British	2,411	245
Barnesmore ..	,,	,,	,,	3,188	283
Collingwood ..	,,	,,	,,	2,396	245
Troja	,,	,,	Foreign	2,729	245
17 Barges	Shipped abroad in pieces			1,300	—
By Short Bros., Sunderland.					
† Cairnisla	Steel	Steam	British	1,597	158
† King Edgar ..	,,	,,	,,	2,552	200
† Kelvin	,,	,,	,,	2,828	245
† Truma	,,	,,	Foreign	1,570	140
† Wilhelmina ..	,,	,,	,,	2,671	200
† Juanita North ..	,,	,,	British	3,503	300
† Mary Ada Short ..	,,	,,	,,	3,605	300
† John Christie ..	,,	,,	Foreign	1,586	140
† Wingrove	,,	,,	British	2,806	240
† Scottish King ..	,,	,,	,,	3,320	450
† Leonidas	,,	,,	Foreign	2,780	220
† Verona	,,	,,	British	3,503	328
By Camper & Nicholson, Gosport.					
Shea	Composite	Sail	British	37·10	—
Avel	Wood	,,	Foreign	17·67	—
Endora	,,	,,	British	11·90	—
Gull	,,	,,	,,	11·90	—
* Ducuna	,,	Steam	,,	25·97	—
Starlight	,,	Sail	,,	7·10	—
Gräfin	,,	,,	,,	7·10	—
By W. H. Lean, Falmouth.					
* Porbudi Chios ..	Wood	Steam	Foreign	36·34	30
No. 18	Steel	Sail	Not sold	165·12	—
By Osbourne, Graham & Co., Hylton, Sunderland.					
† Principessa Cristiana	Steel	Steam	Foreign	2,854	220
† Themis	,,	,,	,,	1,900	170

* Compound. † Triple. ‡ High Pressure.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. N.
By Union Co-operative Shipbuilding Co., Blyth.					
* Europa	Wood	Steam	British	40	40
* Bambro' Castle ..	,,	,,	,,	84	42
By Willoughby Bros., Plymouth.					
* Verne	Steel	Steam	British	45	30
By J. Priestman & Co., Southwick, Sunderland.					
† Rosefield	Steel	Steam	British	3,089	300
† Radley	,,	,,	,,	3,099	300
† Boxgrove	,,	,,	,,	3,046	305
† Reindeer	,,	,,	,,	2,412	217
† Huldra	,,	,,	Foreign	1,156	125
† Karthago	,,	,,	,,	2,855	246
† Unique	,,	,,	,,	2,050	260
By Joseph L. Thompson & Sons, Ltd., North Sands, Sunderland.					
Maria Rickmers ..	Steel	Steam	Foreign	4,932	400
Ellen Rickmers ..	,,	,,	,,	4,930	400
Zero	,,	,,	British	3,066	300
Netherfield ..	,,	,,	,,	3,125	350
Howick Hall ..	,,	,,	,,	3,712	354
Farringford ..	,,	,,	,,	3,146	250
Holywell	,,	,,	,,	3,300	280
Huron	,,	,,	,,	3,090	300
Lavinia	,,	,,	Foreign	4,842	400
Kee Lung ..	,,	,,	,,	1,590	250
Tam Sui	,,	,,	,,	1,590	250
By Robert Thompson & Sons, Sunderland.					
* Islander	Steel	Steam	British	394·78	70
† Hillerag	,,	,,	,,	3256·10	250
† Eversley	,,	,,	,,	2866·15	200
† Rijnstroom ..	,,	,,	Foreign	843·06	250
By Joseph Scarr, Beverley.					
Alexandra ..	Iron	—	British	200	—
Nos. 86, 87, 88 & 89	,,	—	,,	180 ea.	—
* Atalanta	,,	Steam	,,	95	10
Nellie	,,	Sail	,,	115	—
Nos. 92 & 93 ..	,,	—	,,	180 ea.	—
,, 94	,,	—	,,	250	—
,, 95	Steel	—	,,	190	—
,, 96	,,	—	,,	260	—
By Dible & Sons, Belvidere Shipyard, Southampton.					
Kenneth Victor ..	Wood	Sail	British	195	—
By Easton, Anderson & Goolden, Ltd., Erith.					
Rose	Steel	Barge	British	70	—
Valparaiso ..	,,	,,	,,	98	—
Santos	,,	,,	,,	98	—
Denver	,,	,,	,,	98	—
Ottawa	,,	,,	,,	98	—
Rathbale	,,	Sail	,,	85	—
* Empire	,,	Steam	,,	372	250
* Liberty	,,	,,	,,	372	250
By H. Fellows & Son, Yarmouth.					
Sirius	Steel	Sail	British	28	—
* Southtown ..	,,	Steam	,,	72	—
By Cook, Welton & Gemmell, South Bridge Road, Hull.					
* Grecian	Iron	Steam	British	119	45
† 2 Vessels	,,	,,	,,	ea 156·5	ea.50
† 3 Vessels	,,	,,	,,	ea. 160	ea.50
* Irishman	,,	,,	,,	100	40
† 2 Vessels	,,	,,	,,	ea. 159	ea.55
† 3 Vessels	,,	,,	,,	ea. 147	ea.35
† Alert	,,	,,	,,	150	45
† Seti	,,	,,	,,	160	45
* 8 Vessels	,,	,,	,,	ea. 164	ea.45
† 2 Vessels	,,	,,	,,	ea 162	ea.55
† Bengal	,,	,,	,,	150	35
† 2 Vessels	,,	,,	,,	ea. 162	ea.50
† No. 175	,,	,,	,,	159	55
† ,, 176	,,	,,	,,	162	50
† ,, 177	,,	,,	,,	162	55
† Lansdowne ..	Steel	,,	,,	170	96
† No. 179	Iron	,,	,,	160	65

* Compound. † Triple. ‡ High Pressure.

By Edwin Clark & Co., Brimscombe, Stroud, Gloucester.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
* Trilby	Steel	Steam	British	—	4
† Henley	,,	,,	,,	—	80
* Indiana	,,	,,	,,	—	10
† White Cross	,,	,,	,,	—	100

By Sunderland Shipbuilding Co., Sunderland.

† La Pallice	Steel	Steam	Foreign	992·00	500
† Flintshire	,,	,,	British	3,815·18	2,000
† Huascar	,,	,,	Foreign	875·24	630
† Narrung	,,	,,	British	5,078·08	3,200
† Falcon	,,	,,	,,	351·18	475
† Norman	,,	,,	,,	727·54	780

By Furness, Withy & Co., Ltd., West Hartlepool.

No. 220	Steel	Steam	British	2,956	1,000
,, 221	,,	,,	,,	2,746	1,100
,, 222	,,	,,	,,	3,346	1,250
,, 223	,,	,,	,,	3,197	1,500
,, 224	,,	,,	,,	2,507	1,100
,, 225	,,	,,	,,	2,611	900
,, 226	,,	,,	,,	3,353	1,300
,, 227	,,	,,	,,	3,408	1,300
,, 228	,,	,,	,,	3,726	1.300
,, 229	,,	,,	,,	3,773	1,300

By John Readhead & Sons, West Docks, South Shields.

Kylemoor	—	Steam	—	3,104	1,500
Trevose	—	,,	—	3,112	1,500
Trojan Prince	—	,,	—	3,273	2,500
Staintondale	—	,,	—	2,479	1,350
Aysgarth	—	,,	—	3,119	1,500
Savan	—	,,	—	2,585	1,650
Ville de Cette	—	,,	—	1,702	1,250
Cluden	—	,,	—	3,167	1,500

By Wm. White & Sons, West Cowes, I.W.

* Goshawk	Wood	Steam	British	60	20 N.H.P.
* Falaise	Composite	,,	,,	70	20 ,,
Edie	Wood	Sail	,,	12	—
Magnita	Steel	Steam &Elec.	Foreign	50	300
* 3 Government Steam cutters		—	—	—	—

By Blyth Shipbuilding Co., Ltd., Blyth.

† Ardova	Steel	Steam	British	3,139	1,200

By Ropner & Son, Stockton-on-Tees.

† Kingtor	Steel	Steam	British	2,738	1,000
† Talisman	,,	,,	Foreign	1,914	800
† Dorothy	,,	,,	British	2,445	950
† Laurelwood	,,	,,	Foreign	2,485	950
† Veva	,,	,,	British	2,553	950
† Ashby	,,	,,	,,	1,947	800
† Kingswood	,,	,,	Foreign	1,934	800
† Moorby	,,	,,	British	2,606	950
† Æon	,,	,,	,,	2,578	950
† Liv	,,	,,	Foreign	3,108	1,000
† Dunraven	,,	,,	British	3,333	1,200
† Suningdale	,,	,,	,,	2,584	950
† Trunkby	,,	,,	,,	2.635	950
† Yearby	,,	,,	,,	2,635	950
† No. 331	,,	,,	,,	2,800	1,000
† Oakby		,,	,,	1,965	800

By Earle's Shipbuilding & Engineering Co., Ltd., Hull.

† Dido	Steel	Steam	British	4,769	2,200
† Kestrel	,,	,,	,,	95	420
† Argo	,,	,,	,,	137	350
† Bravo	,,	,,	,,	137	350
† Zero	,,	,,	,,	1.143	1,500
† Othello	,,	,,	,,	5.000	2,200
Essex	,,	Pad'le	,,	297	800
† Dresden	,,	Steam	,,	1,850	6,000

* Compound. † Triple. ‡ High Pressure.

By Bartram & Sons, South Dock, Sunderland.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
† Queen Cristina	Steel	Steam	British	3,596	1,600
† Lord Kelvin	,,	,,	,,	3,342	1,500
† Queen Eleanor	,,	,,	,,	3,573	1,600
† Kirkfield	,,	,,	,,	3,602	1,750

By Cochrane & Cooper, Grovehill, Beverley.

Ajax	Iron	Steam	British	120	240
Nos. 144 & 145	,,	—	,,	160ea.	—
2 Trawlers	,,	Steam	,,	134ea.	240ea.
Prince	,,	,,	,,	141	270
2 Trawlers	,,	,,	,,	178ea.	420ea.
Rubico	,,	,,	,,	119	240
Rolando	,,	,,	,,	120	240
Larchwold	,,	,,	,,	129	180
Umguza	,,	,,	,,	138	270
Euphrates	,,	,,	,,	171	420
Golden Crown	,,	,,	,,	182	420
Lucania	,,	,,	,,	186	420
2 Trawlers	,,	,,	,,	147ea.	270ea.
Violet	,,	,,	,,	150	240
Lobelia	,,	,,	,,	148	240
Agatha	,,	,,	,,	137	240
Belgica	,,	,,	Foreign	177	420
Italy	,,	,,	British	145	240
Marie Louise	,,	,,	Foreign	158	320
3 Trawlers	,,	,,	British	150ea.	240ea.
Isa	,,	,,	Foreign	156	320
Veronica	,,	,,	British	145	240
Osborne	,,	,,	,,	137	240
Vanilla	,,	,,	,,	150	320
La Mouette	Steel	,,	Foreign	170	320

By Forrestt & Son, Wyvenhoe, Essex, and Limehouse.

Coryphee	Steel	—	British	12	25
No. 243	,,	—	Foreign	64	—
* Selenga	,,	Steam	,,	159	200
* Khilok	,,	,,	,,	159	200
† No. 246	,,	,,	British	7	95
* Nos. 247, 248 & 249	Wood	,,	Foreign	4ea.	16ea.
2 Lighters	,,	—	British	65·5ea.	—
No. 252, dredger	Steel	Steam	Foreign	26	20
,, 253, ,,	,,	Sail	,,	3	—
* Eveline	Wood	Steam	,,	20	80
* El Dependiente	Steel	,,	,,	39	180
* 8 Boats	,,	,,	,,	117ea.	450ea
* Weber	,,	,,	,,	8	80
Lifeboat	Wood	Sail	British	7	—
Launch	,,	—	,,	4	7
48 Whale-boats, cutters, dinghies and skiffs				—	—
56 Wood pontoons for War Department				—	—

By A. W. Robertson & Co., Lea Shipbuilding Yard, Canning Town.

† Amore	Steel	Steam	British	153	500
7 Lighters	,,	—	,,	600	—
24 Lighters	Iron	—	,,	2070	—
2 Lighters	,,	—	Foreign	100	—

By J. Samuel White, East Cowes, I.W.

* Scud	Steel	Steam	British	45	600
* Hecle	,,	,,	,,	120	180
* Sir Henry Harness	,,	,,	,,	120	300
* Sir Lothian Nicholson	,,	,,	,,	120	300
* Pearl	Wood	,,	,,	17	80
* Vedette boats, pinnaces and launches	Wood	,,	B. & F.	168	900

By J. T. Eltringham & Co., South Shields.

* African Prince	Steel	Steam	British	124·89	270
* Fisher Prince	,,	,,	,,	124·89	270
* Condor	,,	,,	,,	111·57	750
* Conqueror	Iron	,,	,,	220·65	660

* Compound. † Triple. ‡ High Pressure.

By Laird Bros., Birkenhead.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
† H.M.S. Mars ..	Steel	Steam	British	8,000	12,000
† Almirante Simpson	,,	,,	Foreign	610	4,500
† Capitan Orella ..	,,	,,	,,	320	6,000
† Capitan Munoz Gamero	,,	,,	,,	320	6,000
† Teniente Serrano	,,	,,	,,	320	6,000
† Guardia Marina Riquelme	,,	,,	,,	320	6,000
† Ulster	,,	,,	British	2,632	8,500
† Leinster	,,	,,	,,	2,632	8,500
† Munster	,,	,,	,,	2,632	8,500
Not named ..	,,	,,	Foreign	200	200
† H.M.S. Earnest ..	,,	,,	British	320	6,000
† ,, Griffon ..	,,	,,	,,	320	6,000
† ,, Locust ..	,,	,,	,,	320	6,000
† ,, Panther	,,	,,	,,	320	6,000

By G. Rennie & Co., Greenwich.

Harlow	Steel	Steam	British	130 *b*	300
Rameses	,,	,,	,,	140	335
2 Lighters ..	,,	—	,,	240ea.	—
2 Decked Barges..	,,	—	,,	190ea.	—
12 Open ,, ..	,,	—	,,	120ea.	—
14 ,, ,, ..	,,	—	,,	82ea.	—
Nos. 585 & 586 ..	,,	Sail	Foreign	260ea.	—
,, 591 & 592 ..	,,	—	,,	250ea.	—

b Tons displacement.

By Sir Raylton Dixon & Co., Middlesbrough-on-Tees.

Chun Sang ..	Steel	Steam	British	2,218	1,100
Minneburg ..	,,	,,	Foreign	2,540	1,350
Sardonyx	,,	,,	British	2,794	1,250
Albertville ..	,,	,,	Foreign	3,812	2,000
Taquary	,,	,,	,,	2,[illegible]42	1,200
Scheepvaart I. ..	,,	Sail	,,	679	—
,, II. ..	,,	,,	,,	678	—
Zuid Holland ..	,,	Steam	,,	1,203	800
Maceio	,,	,,	,,	2,848	1,200
Oceano	,,	,,	British	2,715	1,130
Jasper	,,	Sail	,,	236	—
Sapphire	,,	,,	,,	236	—
Emerald	,,	,,	,,	236	—
Snark	,,	,,	,,	613	—
Nitocris	,,	Steam	,,	2,669	1,130
Begona	,,	,,	Foreign	2,816	1,050
Leopoldville ..	,,	,,	,,	3,812	2,000
Gleaner	,,	,,	British	132	270
Kingfisher ..	,,	,,	,,	132	270
No. 440	,,	,,	,,	2,900	1,250

By Simpson, Strickland & Co., Ltd., Dartmouth.

———	Wood	Sail	British	35	—
‡ ———	,,	Steam	Foreign	8·5	22
a Puffin	—	,,	British	10	50
———	—	,,	—	4·5	33
———	Steel	,,	Foreign	9·2	50
———	—	,,	—	6·7	33
* Beatrice	Wood	,,	Foreign	5·5	50
* ———	—	,,	British	3·3	23
Prince	—	,,	—	19	46
† ———	—	,,	Foreign	16	55
Campaniella ..	—	,,	,,	6	45
a ———	—	,,	—	7½	33
12 small launches	—	—	—	32	90

By John Stewart & Son, Ltd., Blackwall.

* Pereira do Caruio	Steel	Steam	Foreign	30	75
* John Hollway ..	,,	,,	British	76	300
* Frank	,,	,,	,,	76	300
* Ready	,,	,,	,,	100	300
* Khiloke	,,	,,	Foregn	250	200
* Ceilenga	,,	,,	,,	250	200
† Tiban	,,	,,	,,	150	400
* No. 460	,,	,,	,,	27	80

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* Compound. † Triple. ‡ High Pressure. a Quadruple.

By William Dobson & Co., Low Walker, Newcastle-on-Tyne.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
Emperor Nicholas II.	Steel	Steam	Foreign	1,120	1,200
Kola	,,	,,	,,	206	250
Kandalaksha ..	,,	,,	,,	206	250
Russia	,,	,,	,,	1,291	860
Nordkap	,,	,,	,,	3,566	1,800
Altai	,,	,,	British	2,480	2,600
Orotava	,,	,,	,,	1,626	1,100
New steamer ..	,,	,,	,,	2,751	1,300

By C. S. Swan & Hunter, Ltd., Wallsend-on-Tyne.

† Leitrim	Steel	Steam	British	4,285	2,200
Dock	Iron	—	,,	4,600	—
† Claverhill	Steel	Steam	,,	2,822	1,600
† Neptune	,,	,,	,,	3,366	1,800
† Thornley	,,	,,	,,	2,847	1,600
† Corcovado ..	,,	,,	,,	4,569	2,800
† Milwaukee ..	,,	,,	,,	8,820	3,500
† Mayo	,,	,,	Foreign	1,779	900
* Ekuro	,,	,,	British	485	425
† Saint Mary ..	,,	,,	,,	3,160	1,600
† No. 219	,,	,,	,,	2.875	1,200

By Wm. Gray & Co., Ltd., West Hartlepool,

Inchmona ..	Steel	Steam	British	3,484	1,500
Valhalla	,,	,,	,,	2,628	1,250
Greylands ..	,,	,,	,,	2,625	1,300
Ebani	,,	,,	,,	1.738	1,250
Sigurd	,,	,,	Foreign	2,126	1,100
Simonside ..	,,	,,	British	3,033	1,500
Ragnar	,,	,,	Foreign	2,126	1,100
Jupiter	,,	,,	,,	1,956	900
Alette	,,	,,	,,	3,060	1,550
Atlantic	,,	,,	British	3,095	1,600
Balderton ..	,,	,,	,,	2,620	1,300
Mars	,,	,,	Foreign	1,960	900
Cambrian.. ..	,,	,,	British	5,600	4,000
Jomsborg	,,	,,	Foreign	1,900	1,000
Laristan	,,	,,	British	2,134	1,200
Dalegarth ..	,,	,,	,,	1,560	1,200
Gallia	,,	,,	Foreign	1,900	1,000

By Naval Construction and Armaments Co., Ltd., Barrow-in-Furness.

H.M.S. Doris ..	Steel	Steam	British	5,600	9,600
Clan Menzies ..	,,	,,	,,	2,667	2,300
Clan Lindsay ..	,,	,,	,,	2,668	2,300
Clan Sutherland	,,	,,	,,	2,819	2,300
H.M.S. Avon ..	,,	,,	,,	300	6,000
H.M.S. Bittern ..	,,	,,	,,	300	6,000
H.M.S. Otter ..	,,	,,	,,	300	6,000

By W. H. Potter & Sons, Queen's Dock, Liverpool.

* H.M.S. Escort ..	Steel	Steam	—	—	1,250

By Palmer's Shipbuilding and Iron Co., Ltd., Jarrow-on-Tyne.

Treasury	Steel	Steam	British	2,956	1,000
Asturia	,,	,,	Foreign	5,321	2,500
Adria	,,	,,	,,	5,550	2,500
Armenia	,,	,,	,,	5,561	2,500
Andalusia ..	,,	,,	,,	5,531	2,500
Star	,,	,,	—	353	6,000
Whiting	,,	,,	—	353	6,000
Bat	,,	,,	—	353	6,000
Chamois	,,	,,	—	353	6,000
Socotra	,,	,,	British	6,077	3,800
British Trader ..	,,	,,	,,	3,424	1,500
Crane	,,	,,	—	353	6,000

By Henry Scarr, Beverley.

Mavis	Steel	Sail	British	130	—
* Southern Cross ..	,,	Steam	,,	130	250
Emperor	,,	Sail	,,	150	—
Onward	,,	,,	,,	180	—
Alizarine	,,	,,	,,	85	—
Helena	,,	,,	,,	135	—
———	,,	,,	,,	140	—

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* Compound. † Triple. ‡ High Pressure.

By Wood, Skinner & Co., Bill Quay, Newcastle-on-Tyne.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
† Folsjo	Steel	Steam	Foreign	1,679	900
† Breeze	,,	,,	British	650	420
* T. W. Stuart	,,	,,	,,	252	250
† Hermes	,,	,,	Foreign	1,389	950
† Rosemount	,,	,,	,,	1,580	1,250

By Sir W. G. Armstrong & Co., Ltd., Newcastle-on-Tyne.

Yashima	Steel	Steam	Foreign	12,700	12,000
Ministro Yenteno	,,	,,	,,	3,400	6,000
Barrozo	,,	,,	,,	3,500	7,000
Amazonas	,,	,,	,,	3,500	7,000
Esmeralda	,,	,,	,,	7,300	16,000
Maritta	,,	,,	,,	3,013	1,600
Louisiana	,,	,,	,,	3,018	1,750
Borjone	,,	,,	,,	2,874	1,750
Sokol	,,	,,	,,	60	120
Chaika	,,	,,	,,	184	—
Titania	,,	,,	,,	1,920	1,450
Oberon	,,	,,	,,	1,922	1,450
Baikal Ferry	,,	,,	,,	5,280	4,000
Maria	,,	,,	,,	236	650
Blagovestchensk	,,	,,	,,	340	—
Nicholaievsk	,,	,,	,,	340	—
Caisson	,,	,,	,,	435	—
,,	,,	,,	,,	435	—
Floating Dock	,,	,,	,,	1,500	—
H,M.S. Pactolus	,,	,,	British	2,200	7,000

By Tyne Iron Shipbuilding Co., Ltd., Willington Quay-on-Tyne.

† Tropic	Steel	Steam	British	3,630	2,250
† Fitzpatrick	,,	,,	,,	4,071	2,000
† Oilfield	,,	,,	,,	4,005	2,100
† Port Denison	,,	,,	,,	3,435	1,825
† Gloxinia	,,	,,	,,	2,550	1,600

By Thames Ironworks & Shipbuilding Co., Ltd., Blackwall.

† Fuji	Steel	Steam	Foreign	12,500	13,500
* No. 337	Wood	,,	Admiralty	—	—
* ,, 338	,,	,,	,,	—	—
* ,, 339	,,	,,	,,	—	—

By South Hylton Shipbuilding and Repairing Co., Sunderland.

* Ematra	Steel	Steam	Foreign	67	160
* Bonita	Iron	,,	British	64	150

By Wigham Richardson & Co., Neptune Works, Newcastle-on-Tyne.

Fau Sang	—	—	—	2,251	1,350
b Elisabeth Rickmers	—	—	—	4,867	2,400
b Loongmoon	—	—	—	1,985	1,400
b Innisfallen	—	—	—	1,405	3,500
b Pannonia	—	—	—	795	1,500
Corocoro	—	—	—	4,006	2,400
Tadorna	—	—	—	1,318	1,250
Chiriqui	—	—	—	643	650
b Neidenfels	—	—	—	5,327	2,600
Anping	—	—	—	1,660	1,300
b A	—	—	—	—	1,300
b B Engines and	—	—	—	--	3,100
C Boilers only.	—	—	—	—	1,500
D	—	—	—	—	1,500
E	—	—	—	—	4,500

b Engines balanced on the Yarrow, Schlick & Tweedy system.

By A. Rutherford & Co. Neptune Works, Birkenhead.

No. 934	Wood	Oil	British	2·4	5
,, 936	,,	—	Foreign	13	—
,, 937	,,	—	,,	13	—
,, 938	,,	—	,,	13	—
,, 939	,,	Steam	,,	11·5	35
Eneid	,,	Oil	British	6	12
Princess of Wales	,,	Sail	Foreign	40	—
No. 991	Steel	Oil	,,	7	10

61 Lifeboats, Gigs, Dinghys, Cutters, etc.

* Compound. † Triple. ‡ High Pressure.

By R. & W. Hawthorn, Leslie & Co., Ltd., Hebburn-on-Tyne.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
Ekaterinoslavl	Steel	Steam	Foreign	5,330	3,500
Chater-dag	,,	,,	,,	856	800
Ararat	,,	,,	,,	856	800
Kazbeck	,,	,,	,,	856	800
Young	,,	,,	,,	800	600
Zapad	,,	,,	,,	800	600
Waimate	,,	,,	British	5,610	3,000
Cornwall	,,	,,	,,	5,490	3,100
Devon		,,	,,	5,490	3,100
War Ship (engines only)		,,	Foreign	—	4,500

By Cox & Co., Dock Ironworks, Falmouth.

* Penguin	Steel	Steam	—	95	330
* Conqueror	,,	,,	—	112	410
* Eland	Composite	,,	—	46	210
———	Steel	—	—	100	—
Louisa	,,	—	—	17	—

Marine Engines built by Sir Christopher Furness, Westgarth & Co., Ltd., Middlesbro'.

Name of Vessels.	I.H.P
† Hopper No. 8	675
† Horatio	1,350
† Manzanillo	550
† Clarence	750
† Commonwealth	1,485
† Dagmar	850
† Virdar	890
† Vulcan	1,750
* Ville de Cayenne	290
† Falcon	515
† Gunhild	950
† Gerd	400
* No. 119	290
† Urania	850
Total	11,550

Besides a large amount of general engineering work, and marine and general repairs.

Machinery built by Earle's Shipbuilding & Engineering Co., Ltd., Hull.

H.M.S. Arrogant	10,000
Cameo	1,500
Vigilant	350
Vindex	350
Umguza	350
Turquoise	375
Honoria	400
Iolanthe	400
Prince	350
Grecian	350
Admiral	470
Unyoro	470
Total	29,185

Marine Engines built by W. Doxford & Sons, Ltd., Sunderland.

† Algoa	2,400
† Ashmore	1,350
† Imperialist	1,350
† Bullionist	1,350
† Norman Isles	1,350
† Turret Chief	1,100
† Turret Court	1,100
† Castello	1,500
† Maud Cassel	1,500
† Mayo	1,100
Total	14,100

* Compound. † Triple. ‡ High Pressure.

List of Vessels Engined during 1896 by the WALLSEND SLIPWAY & ENGINEERING Co., LTD.

Name of Vessels.	I.H.P.
† Cowrie	2,300
* Kola	250
* Kandalaksha	250
† Maritta	1,600
† Oilfield	2,100
† Leitrim	2,200
† Corcovado	2,800
† Russia	860
* Maria	650
* Shipped abroad	450
Total	13,460

Marine Engines built by JOHN DICKINSON & SONS, LTD., Sunderland.

No.	Name of Vessels.	I.H.P.
460	Netherfield	1,260
461	Surf	900
462	Farringford	1,350
463	Port Dennison	1,850
464	Queen Eleanor	1,600
465	(Not launched)	1,150
466	Harborne	750
467	Kirkfield	1,750
468	Rookwood	950
469	Lockwood	950
470	Holywell	1,500
471	Wingrove	1,250
472	Altai	2,600
473	Leonidas	1,200
474	Orotava	1,100
476	Kee Lung	1,275
477	Tamsui	1,275
478	(Not launched)	1,750
	Cyprus (old steamer)	800
	Total	25,260

CENTRAL MARINE ENGINE WORKS, West Hartlepool.
Output for Year 1896.

	Name of Vessel.	Port of Registry.	I.H.P
1	Inchmona	Liverpool	1,500
2	Valhalla	West Hartlepool	1,250
3	Greylands	West Hartlepool	1,300
4	Ebani	Liverpool	1,250
5	Sigurd	Copenhagen	1,100
6	Simonside	Sunderland	1,500
7	Ragnar	Copenhagen	1,100
8	Jupiter	Flensburg	900
9	Alette	Hernosand	1,550
10	Atlantic	Hull	1,600
11	Balderton	Bristol	1,300
12	Mars	Flensburg	900
13	Cambrian	London	4,000
14	Jomsborg	Copenhagen	1,000
15	Jacob Bright	London	1,300
16	Laristan	London	1,200
17	Dalegarth	Liverpool	1,200
18	Gallia	Copenhagen	1,000
			24,950

By YARROW & Co., Poplar.

Four twin-screw steel torpedo-boat destroyers, 190 ft. long by 19 ft. 6 in. beam; triple-expansion engines, fitted with Yarrow's patent water-tube boilers; speed, 27 knots. Foreign service.

One shallow-draft steel steamer, 55 ft. long by 8 ft. 6 in. beam; draft, 9 in.; speed, 8 miles. Foreign service.

One steam launch of teak, 32 ft. long by 7 ft. 3 in. beam. Foreign service.

One shallow-draft steel steamer, 123 ft. overall by 24 ft. beam; draft, 13 in.; speed, 13 miles. Foreign service.

One shallow-draft steel steamer, 55 ft. long by 8 ft. 6 in. beam; draft, 9 in.; speed 8 miles. Foreign service.

One screw steam steel launch, 45 ft. long by 8 ft. beam; draft, 2 ft. 9 in. Foreign service.

One twin-screw steel yacht, 80 ft. long by 12 ft. beam. Foreign service.

Six first-class steel torpedo boats, 152 ft. 6 in. long by 15 ft. 3 in. beam, fitted with triple-expansion engines and Yarrow's patent water-tube boilers; speed, 25½ knots. Chilian Government.

One single-screw steel launch, 50 ft. long by 8 ft. beam; draft, 2 ft. 9 in.; speed, 11 miles. Foreign service.

One single-screw steel launch, 72 ft. long by 11 ft. 6 in. beam; draft, 3 ft. 6 in. Foreign service.

One shallow draft steel steamer, 60 ft. long by 12 ft. beam; draft, 9 in. Foreign service.

One steel steam launch, 55 ft. long by 8 ft. beam; draft, 3 ft. 6 in. Foreign service.

Two steam launches, 55 ft. long by 8 ft. beam; draft, 3 ft. 6 in. Foreign service.

One steam launch, 48 ft. long by 7 ft. 6 in. beam; draft, 2 ft. 9 in. Foreign service.

Two Yarrow's Patent water-tube boilers for fast steam yacht. Foreign service.

One second-class torpedo-boat (steel), 60 ft. long by 9 ft. 3 in beam; speed, 20 knots. Foreign service.

One shallow-draft steel steamer, 70 ft. long by 10 ft. beam; draft, 20 in.; speed, 8½ miles an hour. Foreign service.

SCOTCH.

By ALLEY & MACLELLAN, Polmadie, Glasgow.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. N.
* ——	Steel	Steam	Foreign	205	130
* ——	,,	,,	,,	205	130
* ——	,,	,,	,,	205	130
* ——	,,	,,	,,	205	130
* ——	,,	,,	,,	239	130
* ——	,,	,,	,,	100	80
* ——	,,	,,	,,	249	130
——	,,	Barge	,,	470	—
——	,,	,,	,,	470	—
——	,,	,,	,,	476	—
——	,,	,,	,,	476	—
By ARDROSSAN SHIPBUILDING Co., Ardrossan.					
* Paqueta	Steel	St. Y'ht	British	68	14
By BARCLAY, CURLE & Co., LTD., Whiteinch, Glasgow.					
† Mataura	Steel	Steam	British	5,764	469
† Polycarp	,,	,,	,,	2,966	240
† Mount Sepnar	,,	,,	,,	3,702	350
† Guyana	,,	,,	,,	3,669	283
† Neptune	,,	,,	,,	310	120
Duchess of York	,,	,,	,,	302	140
† Dunolly Castle	,,	,,	,,	4,160	408
† Raglan Castle	,,	,,	,,	4,350	408
By GOURLAY BROS. & Co., Dundee.					
† Antonio-Olyntho	Steel	Steam	British	459	110
† Daniel Erno	,,	,,	Foreign	644	180
† Rotterdam	,,	,,	British	1,091	270
† Hesperus	,,	,,	,,	580	200
By MARSHALL & Co., Maryhill, N.B.					
* Forward	Steel	Steam	British	85	14
By SCOTT & SONS, Bowling, Glasgow.					
† Nephrite	Steel	Steam	British	673	90
* Tartar	,,	,,	,,	266	69
† Start	,,	,,	Foreign	606	98
* Kittiwake	,,	,,	British	366	81
† Topaz	,,	,,	,,	696	90
By DUNDEE SHIPBUILDERS' Co., LTD., Dundee.					
† Ogun	Steel	Steam	Foreign	350	60
* Marie	,,	,,	British	40	25

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* Compound. † Triple.

* Compound. † Triple.

By Geo. Duncan, Bankhead, Macduff, N.B.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. N.
Clan McLeod ..	Wood	Sail	British	8	—

By Archd. McMillan & Son, Ltd., Dumbarton.

Perseverance ..	Steel	Sail	British	1,900	—
Conway	,,	,,	,,	1,900	—
Spero	,,	Steam	,,	1,150	—
Yucatan	,,	,,	Foreign	800	—
Tehuantepec ..	,,	,,	,,	800	—
Hawea	,,	,,	,,	1,750	—
Fujisan Maree ..	,,	,,	,,	1,900	—
5 Steel Barges ..	,,	,,	,,abt.	2,250	—

Seath & Co., Rutherglen, Glasgow.

3 Small Vessels ..	—	—	Foreign	—	—
2 ,, ,, ..	—	—	British	—	—

About 687 tons in all.

By Campbeltown Shipbuilding Co., Campbeltown.

† Heather Bell ..	Steel	Steam	British	1,253	115
† Luigia Premuda..	,,	,,	Foreign	1,254	115
† Dunerio	,,	,,	British	1,878	150

By John Shearer & Son, Kelvinhaugh, N.B.

* Pearl	Steel	Steam	British	692	90

By William Fife & Son, Fairlie, N.B.

Helen	—	Sail	British	25	—
Fricka	—	,,	,,	8	—
Thella	—	,,	,,	9	—
Hip	—	,,	Foreign	9	—
Jura	—	,,	British	6	—
The Saint.. ..	—	,,	,,	37	—
Snarleyow ..	—	,,	,,	3	—
Canada	—	,,	Foreign	24	—
No. 375	—	,,	,,	6	—
The Tern	—	,,	British	14	—
Mercia	—	,,	,,	5	—

By John Fullerton & Co., Paisley.

† Saint Olaf ..	Steel	Steam	British	606·75	110
* Dona Catalina ..	,,	,,	Foreign	195·44	72
* Eller	,,	,,	British	243·20	48
* Alerto	,,	,,	,,	21·60	12
* Christiana ..	,,	,,	,,	295·13	45
* Clint	,,	,,	,,	215·33	48
* Joseph Fisher ..	,,	,,	,,	286·48	48

By Ramage & Ferguson, Ltd., Leith.

† Iolaire	Steel	Steam	British	715	142
† Rasona	,,	,,	,,	952	99
† Frontier	,,	,,	Foreign	191	52
† Speedy II. ..	,,	,,	British	288	69
‡ Cooljak	,,	,,	Foreign	10	—

By Wm. Denny & Bros., Leven Shipyard, Dumbarton.

Calais	—	Steam	British	979	—
Sussex	—	,,	,,	1,117	—
Southend Belle ..	—	,,	,,	570	—
Prince Arthur ..	—	,,	,,	578	—
Burma	—	,,	,,	3,584	—
Onipenta	—	,,	,,	5,294	—
Dredger "R" ..	—	—	,,	40	—
Oolobaria	—	Steam	,,	5,294	—
Connemara ..	—	,,	,,	1,110	—
Lord Warden ..	—	,,	,,	979	—
Moana	—	,,	,,	3,900	—
8 Paddle Steamers	—	,,	Foreign	4,181	—
1 Twin Screw Steamer	—	,,	,,	147	—
14 Barges ..	—	—	,,	4,904	—

By The Caledon Shipbuilding and Engineering Co., Ltd., Dundee.

† Garmoyle.. ..	Steel	Steam	British	1,200	about.

By S. M'Knight & Co., Ayr.

* Britannia.. ..	Steel	Steam	British	460	325
Ferry Boat for Vehi	cle and pas	sr. tra	ffic ,,	92	—
Barge for Japan..	—	—	Foreign	108	—

* Compound. † Triple. ‡ High Pressure.

By James Millar, St. Monance, N.B.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. N.
Isabella	Wood	Sail	British	30	—
Mackays	,,	,,	—	—	—
Unity	—	—	—	—	—
Pursuit	—	—	—	—	—
Barbara Davidson	—	—	—	—	—

By Russell & Co., Port-Glasgow.

Ceres	—	Steam	British	3576·36	—
Minerva	—	,,	,,	3576·36	—
Venus	—	,,	,,	3555·52	—
Ymer	—	,,	Foreign	3455·89	—
Mantinea ..	—	,,	British	2732·22	—
Thornliebank ..	—	Sail	,,	2104·72	—
Australian ..	—	,,	,,	2104·72	—
Fairport	—	,,	,,	1996·20	—
Duns Law ..	—	,,	,,	1639·39	—
Sound of Jura ..	—	,,	,,	1109·06	—
Westfield ..	—	,,	,,	1108·26	—
Cassiporé ..	—	Steam	,,	484·34	—
Rio Affuá	—	,,	Foreign	460·00	—
Mamorrà ..	—	,,	,,	449 24	—
Bhadra	—	,,	British	600·00	—
Clutha, No. 11 ..	—	,,	,,	81·86	—
Clutha, No. 12 ..	—	,,	,,	81·86	—

By Caird & Co., Ltd., Greenock.

† India	Steel	Steam	British	7,910	4400
† Candia	,,	,,	,,	6,482	
† Chile	,,	,,	,,	3,225	
† Peru	,,	,,	,,	3.225	

By Blackwood & Gordon, Port-Glasgow.

† Carlow	Steel	Steam	British	1,274	398
* Margarita.. ..	,,	,,	Foreign	173	75
No. 234	,,	,,	,,	155	—
,, 235	,,	,,	,,	155	—
† Lily	,,	,,	British	668	127

By Robert Duncan & Co., Ltd., Port-Glasgow.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
Honolulu	Steel	Sail	Foreign	1,073	—
† Taormina ..	,,	Steam	,,	1,304	900
† Kia Ora	,,	,,	British	300	600

By Grangemouth Dockyard Co., Grangemouth.

† Princess	Steel	Steam	Foreign	542	940
* Berandan	,,	,,	,,	466	300

By Wm. Hamilton & Co., Port-Glasgow.

† Hillbrook	Steel	Steam	British	2,843	1,200
† Lynrswan ..	,,	,,	,,	2,843	1,200
† Ardath	,,	,,	,,	2,901	1,350
† Hai-Mun	,,	,,	Foreign	1,312	1,700
Musselcrag ..	,,	Sail	British	1,985	—
Falkirk	,,	,,	,,	1,986	—
Will Scott ..	,,	,,	,,	1,985	—

By A. & J. Inglis, Pointhouse, Glasgow.

† Pointer	Steel	Steam	British	1,180	1,820
Talisman	,,	,,	,,	278	1,800
† Varuna	,,	,,	Foreign	1,573	4,500
† Paris	,,	,,	,,	2,050	3,000

By Wm. Simons & Co., Ltd., Renfrew, N.B.

* St. Ives	—	Steam	British	1,250	1,150
* St. Austell ..	—	,,	,,	1,250	1.150
† Sir John Coode ..	—	,,	Foreign	950	1,375
* No. 4	—	,,	British	625	645
* No. 5	—	,,	,,	625	645
* No. 6	—	,,	,,	625	645
† Parmelia	—	,,	Foreign	535	920
† Slaney	—	,,	British	300	320
† Lyster	—	,,	,,	1,250	1,350
* Cornwall	—	,,	,,	850	1,225

* Compound. † Triple. ‡ High Pressure.

By John Scott & Co., Kinghorn, Fife.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
* Emily	Steel	Steam	British	142	200
† Grang Seng ..	"	"	"	1,183	1,100
* John Herron ..	"	"	"	333	1,000
* Pansy	"	"	"	333	1,000
† Tetuan	"	"	"	1,395	1,100
By London and Glasgow Shipbuilding Co., Govan, Glasgow.					
† H.M.S. Dido ..	Stl.Sh'th'd	Steam	British	5,600b	9,600
† H.M.S. Isis ..	"	"	"	5,600b	9,600
† Glenlochy.. ..	Steel	"	"	4,654	3,700
† Glenturret ..	"	"	"	4,695	3,700
† Sui Wo	"	"	"	2,672	1,550
b Displacement.					
By Ailsa Shipbuilding Co., Troon, N.B.					
a Margarita.. ..	Steel	StYct	Foreign	1,322	3,000
† Indravati	"	Steam	British	1,053	1,100
† Cumbria	"	"	"	695	1,200
* Rob Roy	"	"	"	130	360
† Lady Roberts ..	"	"	"	1,500	2,200
* Priscilla	"	"	"	243	320
By David J. Dunlop & Co., Port-Glasgow.					
* Trieste	Steel	Steam	British	120	350
* Paris	"	"	"	120	350
† Tutanekai.. ..	"	"	Foreign	820	2,100
† Ibadan	"	"	British	800	850
† Ilorin	"	"	"	950	1,100
† Christine	"	"	"	200	350
By Hawthorns & Co., Leith.					
† Magnus	Steel	Steam	British	160	350
* Kellie Castle ..	"	"	"	120	275
* Isle of May ..	"	"	"	120	275
* County of Fife ..	"	"	"	120	275
* Lord Wolseley ..	"	"	"	280	350
† Leonie	"	"	Foreign	160	350
† Eugenia	"	"	"	165	350
By Lobnitz & Co., Ltd., Renfrew.					
† Okinawa Maru ..	Steel	Steam	Foreign	2,109	2,300
† Industry	—	—	"	148	250
Nos. 1 to 8 ..	—	—	British	1,200	—
† N. J. Fjord ..	"	"	Foreign	1,425	2,300
* Sandbeck	"	"	British	293	300
† Ficaria	"	"	Foreign	1,527	2,750
† Primula	"	"	"	1,527	2,750
* Avant Garde ..	"	"	"	100	200
† Monkey	"	"	British	150	300
By Ritchie, Graham & Milne, Whiteinch, Glasgow.					
* 1 Screw Tug ..	Steel	—	Foreign	60	140
1 Cargo Barge ..	"	—	"	45	—
1 Water Barge ..	"	—	"	70	—
2 " " ..	"	—	"	96	—
* 1 Stern Wheel Steamer	"	—	"	60	90
* 1 Twin Screw Steamer	"	—	"	200	360
* 1 Screw Steamer..	"	—	"	230	360
1 Cargo Barge ..	"	—	"	30	—
* 1 Screw Tug ..	"	—	"	60	140
2 Cargo Barges ..	"	—	"	100	—
* 1 Screw Launch ..	"	—	"	20	55
* 1 Stern Wheel Steamer	"	—	"	240	380
2 Cargo Barges ..	"	—	"	36	—
* 1 Screw Steamer..	"	—	"	140	200
2 Cargo Barges ..	"	—	"	140	—
* 1 Screw Steamer	"	—	"	66	155
By Alex. Hall & Co., Footdee Aberdeen.					
* Phalarope.. ..	Steel	Steam	British	125	320
* Brilliant Star ..	"	"	"	125	320
* Agnes	"	"	"	125	320
* Prestige	"	"	"	125	320
* Lapwing	"	"	"	125	320
* Chinkiang ..	"	"	"	125	320
* Star of Hope ..	"	"	"	125	320

* Compound. † Triple. ‡ High Pressure. a Quadruple.

By Carmichael, McLean & Co., Main Street, Greenock.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
* Lourenco	Steel	Steam	British	70	150
† Activ	"	"	Foreign	760	550
By Fleming & Ferguso Paisley.					
* Sir Evelyn Wood	Steel	Ste	British	500	500
* 2 Hopper Steamers	"		"	1,200	1,200
* Sprite	"		"	100	500
* Elf	"		"	100	500
* Lough Mahon ..	"		"	500	500
† Casuarina ..	"		"	1,000	1,000
No. 247	"	Sail	"	200	—
† Owenabuee ..	"	Steam	"	1,200	800
† No. 246	"	"	"	1,200	800
By J. & G. Thomson, Ltd., Clydebank, N.B.					
Kiev	—	Steam	Foreign	—	—
Brazen	—	"	British	—	—
Electra	—	"	"	—	—
Recruit	—	"	"	—	—
Vulture	—	"	"	—	—
Furor	—	"	Foreign	—	—
Terror	—	"	"	—	—
Jupiter	—	"	British	—	—
Mayflower ..	—	"	"	—	—
Victoria	—	"	"	—	—
			Totals,	10,492	50,850
By A. Rodger & Co., Port-Glasgow.					
Pendeen	—	Sail	British	1964·35	—
Glenholm	—	"	"	1968·22	—
Lindley	—	"	"	1615·47	—
Glenlee	—	"	"	1613·36	—
Baron Innr dale..	—	Steam	"	3343·81	—
Gaivota	—	"	Foreign	203·44	—
Sapucaia	—	"	"	397·52	—
Barcellos	—	"	"	397·99	—
By David & William Henderson & Co., Partick, Glasgow.					
† Bellailsa	Steel	Steam	British	3,798	2,620
† Bellasco	"	"	"	3,803	2,620
† Virgil	"	"	"	3,339	2,720
† Canning	"	"	"	5,366	4,400
Meteor	Composite	Sail	Foreign	12	—
† Kanagawa Maru	Steel	Steam	"	5,824	4,000
† Hakata Maru ..	"	"	"	5,824	4,000
By Napier, Shanks & Bell, Yoker, Glasgow.					
Restauracion ..	Steel	Steam	Foreign	564	1,600
Maria	"	"	British	786	1,300
Wakatere	"	"	Foreign	441	1,600
Paddle Steamer ..	"	"	"	70	—
By Charles Connell & Co., Whiteinch, Glasgow.					
Bellevue	Steel	Steam	British	3,815	1,630
In raghiri ..	"	"	"	4,927	2,300
Augsburg	"	"	Foreign	4,928	2,500
Ammon	"	"	"	4,636	2,200
Amasis	"	"	"	4,636	2,200
Cervona	"	"	British	3,780	2,000
Devona	"	"	"	3,780	2,000
Calista	"	"	"	172	200
Oriana	"	"	"	172	200
Anping	"	"	Foreign	1,880	1,650
Taishun	"	"	"	2,010	1,500
Indra	"	"	British	6,128	2,300
By James Adam, Gourock.					
* Katumba	Wood	Steam	British	22	45
Steam Launch ..	"	"	"	—	—
* Viola	"	"	"	18	20
Launch	"	—	"	—	—
R. Napier & Sons, Lancefield, Glasgow.					
St. Vincent ..	Steel	Steam	British	1,600	—
† La Plata	"	"	"	3,500	2,700
† Minho	"	"	"	3,500	2,700
† Ebro	"	"	"	3,500	2,700

* Compound. † Triple. ‡ High Pressure.

By Hall, Russell & Co., Aberdeen.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H. P. I.
* Craigievar	Steel	Steam	British	112	310
* Craigmillar ..	,,	,,	,,	112	310
* Smiling Morn ..	,,	,,	,,	126	320
* Vineyard	,,	,,	,,	126	320
† Inyati	,,	,,	,,	2,516	2,500

By J. McArthur & Co., Abbotsinch, Paisley.

No. 2.	Steel	Steam	Foreign	74	400
Benares	,,	,,	,,	328	500
Ballechin	,,	,,	,,	62	200
———	,,	,,	,,	72	200

By John Reid & Co., Ltd., Whiteinch, Glasgow.

† Palena	Steel	Steam	Foreign	2,553	3,600
† Joann Kronstatskie	,,	,,	,,	116	365
Indian Empire ..	,,	Sail	British	1,739	—
Serpolette.. Volga .. White Friar	,,	Steam	,,	204	483
5 Chilian Patrol Launches ..	Wood	,,	Foreign	—	—
6 Lighters ..	Steel	—	,,	852	—

By Scott & Co., Cartsdyke, Greenock.

Promethus ..	—	Steam	Foreign	5,204	4,600
Glaucus	—	,,	,,	5,219	4,600
Hawk	—	,,	—	25	100
Itahy	—	,,	Foreign	665	500
Itaya	—	,,	,,	665	500
Itambi	—	,,	,,	665	500
Allinga	—	,,	,,	2,250	1,700
Ægusa	—	,,	—	1,230	2,500
Lady Wentworth .	—	,,	—	2,715	—

By Alex. Stephen & Sons, Linthouse, Govan.

† Grenada	Steel	Steam	British	2,266	2,040
† Idaho	,,	,,	,,	5,808	4,840
† Megantic	,,	,,	,,	5,808	4,840
† Benvorlich ..	,,	,,	,,	3,550	1,970
† Clan Chisholm ..	,,	,,	,,	2,779	2,100
† Clan Ogilvy ..	,,	,,	,,	2,779	2,170
† Lakmé	,,	,,	Foreign	3,265	2,020
† Pisa	,,	,,	,,	4,830	3,500
† Nyanza	,,	,,	British	4,100	1,900

By Murdoch & Murray, Port-Glasgow.

† Continente ..	Steel	Steam	Foreign	1,219	1,200
† Kirkbam	,,	,,	British	319	400
* Portugal	,,	,,	Foreign	148	360
† Cidade de Manoas	,,	,,	,,	414	600
† Francis Henderson	,,	,,	British	275	360
† Leonard Spear ..	,,	,,	,,	275	360
† Rio Musco .	,,	,,	Foreign	302	430
* Ipixuna	,,	,,	,,	269	300

By Fairfield Shipbuilding & Engineering Co., Ltd., Govan, Glasgow.

Dunvegan Castle	—	—	—	Total 29,987	Total 35,650
H.M.S. Diadem ..	—	—	—		
St. Elvies.. ..	—	—	—		
Tintagel Castle ..	—	—	—		
Avondale Castle ..	—	—	—		

By Mackie & Thomson, Govan, Glasgow.

† 2 Steamers ..	St'l. & Ir'n	Steam	British	ea. 158	ea. 35^0
† Countess	Steel	,,	,,	649	950
Annie Thomas ..	,,	Sail	,,	1,936	—
† Germaine	,,	Steam	Foreign	160	350
† J. Leyman ..	,,	,,	British	175	450
* 2 Steamers ..	,,	,,	,,	ea. 119	ea. 350
* Trafford	,,	,,	,,	231	450
† 7 Vessels	,,	,,	,,	ea. 133	ea. 300
† 10 ,, ...	,,	,,	,,	ea. 164	ea. 300
† 2 ,, ...	,,	,,	,,	ea. 350	ea. 750
† 3 ,, ...	,,	,,	,,	ea. 164	ea. 300

* Compound. † Triple.

By John Cran & Co., Leith.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
* Huskisson ..	Steel	Steam	British	150	500

By Cumming & Ellis, Inverkeithing, N.B.

* Guardian	Steel	Steam	British	380	400

Machinery turned out by Denny & Co., Dumbarton, in the year ending 31st December, 1896.

Name of Vessel	Description of Machinery.	Trade.
Voronej	Triple twin screw	Eastern
Dover	Triple paddle	Channel
Calais	Triple paddle	Channel
Sussex	Triple four-crank twin screw	Channel
Southend Belle	Triple paddle	River
Eagle	Triple paddle	River
Kite	Triple paddle	River
Prince Arthur ..	Triple twin screw	Channel
Afghan	Triple paddle	River
Ghoorkha ..	Triple paddle	River
Ghazi	Triple paddle	River
Burma	Triple single screw	Eastern
Onipenta ..	Triple single screw	Eastern
Oolobaria ..	Triple twin screw	Eastern
Ava	Triple paddle	River
Bhamo	Triple paddle	River
Connemara ..	Triple twin screw	Channel
Lord Warden ..	Triple paddle	Channel
Hindustan ..	Triple paddle	River
Salween	Compound twin screw ..	Towing

Total Indicated Horse Power, 44,000.

Machinery built by Bow, McLachlan & Co., Thistle Works, Paisley.

12,080 I.H.P., including one set of compound surface-condensing paddle engines of 1,850 I.H.P. for p.s. Wakatere, built by Messrs. Napier, Shanks & Bell, Yoker; one set of 600 I.H.P. for p.s. Benares, built by Messrs. J. MacArthur & Co., Paisley; 8 sets compound surface-condensing twin-screw engines; 8 sets compound surface-condensing single-screw engines; 3 sets compound non-condensing screw engines and 2 sets compound stern-wheel engines, all shipped abroad.

This firm have also supplied to the order of a London company, for Calcutta, one set of compound Corliss land engines of 1,500 I.H.P., also hand steering gears for H.M.S. Powerful, Mars, Niobe, Dido, and Isis; and the steam steering gears for H.M.S. Mars, Victorious, Illustrious, Minerva, Gladiator, Niobe, Furious, Arrogant, Juno, Doris, Diana and Venus, and 14 torpedo-boat destroyers.

IRISH.

By Harland & Wolff, Belfast.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
† Iran	Steel	Steam	British	6,250	3,000
† China	,,	,,	,,	7,899	10,000
† Canada	,,	,,	,,	8,806	7,550
† Istrar	,,	,,	,,	4,582	3,000
a Pennsylvania ..	,,	,,	Foreign	13,700	5,578
† European	,,	,,	British	8,196	3,000
† Gascon	,,	,,	,,	6,480	3,050
† Gaika	,,	,,	,,	6,480	3,050
† Comic	,,	,,	,,	935	1,550
a Arabia	,,	,,	Foreign	5,750	2,664
a Arcadia	,,	,,	,,	5,750	2,664
† Oravia	,,	,,	British	5,517	4,218
Scot	Lngtd. 54 f	t. (incr	d. tonge.)	971	—
† H.M.S. Hannibal	Engines	only	—	—	12,000

* Compound. † Triple. ‡ High Pressure. *a* Quadruple.

By Workman, Clark & Co., Ltd., Belfast.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
Caisson	Steel	—	—	700	—
† Denton Grange ..	"	Steam	British	5,807	2,750
† Patroclus	"	"	"	5,179	4,000
† Antenor	"	"	"	5,184	4,000
Lord Dufferin ..	"	Sail	"	2,269	—
† Magician	"	Steam	"	5,065	2,350
† City of Sparta ..	"	"	"	5,100	3,400
Kamakura Maru ..	"	"	Foreign	5,850	—
Steel Lighter ..	"	—	—	180	—
" " ..	"	—	—	180	—
† Belvidere	"	Steam	British	1,650	2.500
† Hidalgo	"	"	Foreign	1,176	850

AMERICAN.

By Fore River Engine Co., Weymouth, Mass., U.S.A.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. N.
* Indolent	Wood	Steam	Americn	120	21
Hyperion	"	Sail	"	23	—
Erycina	"	"	"	14	—
Melusina	"	Gas	"	29	5

By Charles Hillman Ship and Engine Building Co., Philadelphia, U.S.A.

Willie	Wood	Steam	Americn	15·75	—
† Wenthrop ..	Steel	"	"	352·35	—
* Radiant	"	"	"	60·84	—
* St. Louis	"	"	"	1273·41	—

Union Dry Dock Co., Buffalo, U.S.A.

† Enquirer	Steel	Steam	Americn	140·36	—
† Ramapo	"	"	"	3045 03	—

By Harlan and Hollingsworth Co., Wilmington, Del., U.S.A.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
† Hampton Roads ..	Steel	Steam	Americn	450	800
* Shinnecock ..	"	"	"	1,205	1,500
† Atlas	"	"	"	400	600
† Catawissa ..	"	"	"	800	1,000

Neafie & Levy, Penn Works, Philadelphia, U.S.A.

* Middletown ..	Steel	Steam	Americn	1,554	1,100
* Columbia	"	"	"	84	225
† Reina de Los Angelos	"	"	Foreign	1,350	1,100
† Donato Guerra ..	"	"	"	412	600
* Gwynedd	"	"	Americn	115	300
* City of Philadelphia (Machinery only)	Wood	"	"	500	350
* Millie K. Ridgway (Machinery only)	"	"	"	20	100

Detroit Dry Dock Co., Detroit, Mich., U.S.A.

† Senator	Steel	Steam	Americn	4048·75	1,400
† Aragon	"	"	"	1450·09	750
† Sir Wm. Fairbairn	"	"	"	4219·74	1,800
† Robert Fulton ..	"	"	"	4219·74	1,800

By F. W. Wheeler & Co., West Bay City, Mich., U.S.A.

† L. C. Waldo ..	Steel	Steam	Americn	4244·26	2,500
† City of Bangor ..	"	"	"	3690·90	2,200
† E. W. Oglebay ..	"	"	"	3666·19	2,500
† Lagonda	"	"	"	3647·40	2,500
† George Stephenson	"	"	"	4583·69	3,000
James Nasmyth ..	"	Sail	"	3418·98	—
Sir Isaac Lothian Bell	"	"	"	3418·98	—
* Pere Marquette ..	"	Steam	"	—	2,400

* Compound, † Triple. ‡ High Pressure.

By Bath Iron Works, Bath, Maine, U.S.A.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
† Peregrine	Steel	Steam	Americn	246·86	800
Light Vessel, 66 ..	Composite	"	"	589·52 b	350
† Illawarra	Steel	"	"	118·9	375
† Vicksburg	Composite	"	"	1,000 b	800
† Newport	"	"	"	1,000 b	800

b Displacement.

Newport News Shipbuilding and Dry Dock Co., Newport News, U.S.A.

† Helena	Steel	Steam	Americn	1,350b	1,600
aLa Grande Duchesse	"	"	"	5,020	7,500
† Creole	"	"	"	3,990	3,500
* Sommers N. Smith	"	"	"	212	600
* Margaret	"	Pad'le	"	675	550

b Displacement.

By Cleveland Shipbuilding Co., Cleveland, O., U.S.A.

* Edna T.	Steel	Steam	Americn	154·15	700
† Queen City ..	"	"	"	3979·68	1,700
† James Watt ..	"	"	"	4090·28	2,000

By Wm. Cramp and Sons, Philadelphia, U.S.A.

† Atlanta	Steel	Steam	Americn	2,094	2,200
Pittsburg	"	"	"	1,000	1,800
† U.S. Rev. Cutt'r 3	Composite	"	"	1,280	2,000

By Chicago Shipbuilding Co., South Chicago, Ill., U.S.A.

Manda	Steel	Sail	Americn	3256·09	—
Martha	"	"	"	3256·09	—
George E. Hartnell	"	"	"	3265 50	—
† George N. Orr ..	"	Steam	"	2872·71	1,500
† Maricopa	"	"	"	4223·57	2,000
Magna	"	Sail	"	3259·43	—
George H. Corliss	"	"	"	3259·43	—
Alfred Krupp ..	"	"	"	3259·43	—

By Atlantic Works, East Boston, Mass., U.S.A.

† Guardian	Wood	Steam	Americn	124·88	500

By Globe Iron Works Co., Cleveland, O., U.S.A.

† Coralia	Steel	Steam	Americn	4330 87	1,500
† Sir Henry Bessemer	"	"	"	4321·10	2,000
† Sir William Siemens	"	"	"	4344·49	2,000
† Gresham	"	"	"	—	2,000

By Delaware River Iron Shipbuilding and Engine Works, Chester, Pa.

† Aileen	Steel	Steam	Americn	151·33	400
† Parthenia ..	"	"	"	130·91	400
† Mohawk	"	"	"	2783·53	1,600
† Mohegan ..	"	"	"	2783·53	1,600
* Virginia	"	"	"	667·98	600
* Florida	"	"	"	667 98	600
† John Englis ..	"	"	"	a bt.3200	4,000
286 & 287 ..	"	Ba'ges	"	—	—

GERMAN.

By Janssen & Schmilinsky, Hamburg.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. N.
Accumulator ..	Steel	El'tric	German	232	30 ef.
* Hafenpolizei Altona	"	Steam	"	214	5
* Büsch	"	"	"	101	22
* Bugenhagen ..	"	"	"	106	22
* Balder	"	"	"	162	30
G. Niemeyer II. ..	"	Benzin	"	5	4 ef.
Launch	"	—	"	8	—
"	"	—	"	75	—
"	"	—	"	75	—
* Fehmarn	"	Steam	"	176	40
* Resolut	"	"	"	37	15
* Fairplay II. ..	"	"	"	82	40

* Compound. † Triple. ‡ High Pressure. a Quadruple.

By J. W. Klawitter, Danzig.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. N.
† Minna	Steel	Steam	German	963	150
* Dunzig	„	„	„	—	25
* Danzig	„	„	„	—	70

By Rickmers Co., Bremerhaven.

† Langeoog	Steel	Steam	German	142	80
Rickmer Rickmers	„	Sail	„	2,007	—
* Helgoland	„	Steam	„	100	80
Bombay	„	Lig'tr	„	318	—
Calcutta	„	„	„	328	—
La Plata	„	„	„	330	—
Azow	„	„	„	329	—

By Vulcan Co., Stettin.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
a Friedrich der Grogse	Steel	Steam	German	10,535	7,000
a Konigin Luise	„	„	„	10,535	7,000

By Gebruder Sachsenberg, Gesellschaft mit beschränkter Haftung, Rosslau, Elbe, Anhalt.

* Elfafs Lothringen	Steel	Steam	German	*b*85	160
† Stadt Fürftenwalde	„	„	„	*b*90	150
Deutsch-Oesterreichifche D.S.G.					
* No. III.	„	Pad'le	„	*b*356	450
* „ „ No. IV.	„	„	„	*b*356	450
* „ „ No. V.	„	„	„	*b*356	450
* „ „ No. VI.	„	„	„	*b*310	400
† LouisGutjahr, No. X.	„	„	„	*b*580	960
† Johann Küppers, No. V.	„	„	„	*b*580	960
* Deutschland	„	„	„	*b*665	850
Bongo I.	Galv. Steel	Sail	Foreign	*b*42	—
„ II.	„	„	„	*b*42	—
„ III.	„	„	„	*b*42	—
„ IV.	„	„	„	*b*42	—

b Tons Displacement.

Flensburger Schiffsbau Gesellschaft, Flensburg.

† Bangalore	Steel	Steam	German	5,060	1,800
† Bhandara	„	„	„	5,043	1,800
† Quarta	„	„	„	1,824	900
a Theben	„	„	„	4,600	1,750

By Howaldtswerke, Kiel.

† Petka	Steel	Steam	Austrian	501	650
† No. 301	Oak	„	German	8	100
† Präsident Koch	Steel	„	„	116	205
* KronprinzFriedrich Wilhelm	„	„	„	38	50
* PrinzEitelFriedrich	„	„	„	38	50
* Prinz Adalbert	„	„	„	38	50
* Prinz August	„	„	„	38	50
* Prinz Oskar	„	„	„	38	50
* Prinz Joachim	„	„	„	38	50
† Helene	„	„	Danish	1,584	700
† Brunsbüttel II.	„	„	German	185	350
† Johann Schweffel	„	„	„	68	180
* Floriano Peixoto	„	„	„	13	22
* Agda	„	„	Danish	54	70
* S. H.	„	„	Rmnian.	11	22
* Stettin	„	„	German	ab. 70	95
* Rostock	„	„	„	„ 70	95
* Konigsberg	„	„	„	„ 75	95
† Normannia *	„	„	Danish	2,650	1,100

By Schiffswerft von Henry Koch, Lübeck.

† Süllberg	Steel	Steam	German	1,260	540
† Cressida	„	„	„	1,235	540
† Zar	„	„	„	877	450
* Meta	„	„	„	200	250

* Compound. † Triple. *a* Quadruple.

By J. C. Tecklenborg, Geestemunde.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
* Alster	Steel	Steam	Foreign	750	400
† Diamante	„	„	„	400	300
† Butjadingen	„	„	German	140	300
† St. Johann	„	„	„	140	300
† Sonne	„	„	„	140	300
† Mond	„	„	„	140	300
* Dampfschute I.	„	„	„	400	200
Elevatorschiff	„	—	„	340	—
Seeleichter No. 152	„	—	„	280	—
„ No. 153	„	—	„	280	—

By Actien Gesellschaft Neptun Schiffswerft & Maschienfabrik, Rostock.

* Burgermeister Massmann	Steel	Steam	German	352	340
* Widder	„	„	„	48	45
* Blankenese	„	„	„	158	300
† Marie Thorn	„	„	„	1,217	520
* Wilhelmshafen	„	„	„	158	300
* Union	„	„	„	158	300

By Reiherstieg Schiffswerfte und Maschinenfabrik, Hamburg.

† König	Steel	Steam	German	4819·75	2,400

By Schiffund Maschinbau Actien Gesellschaft, Germania, Werft Kiel.

* Charlotte	Steel	Steam	German	—	40
† Timbira	„	„	Brazil	718	7,000
† Tupy	„	„	„	718	7,000
† Baden (Reconstr.)	Iron	„	German	—	6,000

AUSTRIAN.

By Stabilimento Tecnico, Trieste.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
† Budapest	Steel	Steam	Austria	5,600	9,500
* Eduard	„	„	Foreign	480	360
† Mozor	„	„	Austria	133	380
† Liburnia	„	„	„	179	450
† Ossero	„	„	„	194	450
† Arsa	„	„	„	250	700
† 2 Tugboats	„	„	„	50	120

SWEDEN.

By Motala Mekaniska, Werkstad A.B., Motala.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P N.
* Wermdo II.	Steel	Steam	Sweden	127·85	50
* Poschkar	„	„	Foreign	78·93	60

By W. Lindbergs, Verkstads och Varfs Aktiebolag, Stockholm.

* Carl	Steel	Steam	Swedish	—	25
Gulli	„	„	„	—	—

By Kockums Mekaniska, Verkstads Aktiebolag, Malmo.

Aera	Steel	Sail	Swedish	112	—
Belize	„	„	„	324	—
† Isbrytaren	„	Steam	„	550	250

HOLLAND.

Maatschappij voor Scheeps-en-Werktuigbouw, "Fyenoord," Rotterdam.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. N.
* Neptunus	Steel	Steam	Dutch	173	32
† Friesland	„	„	„	3,900*b*	1,000

b Displacement.

* Compound. † Triple.

By Royal Shipbuilding and Engineering Co., De Schelde, Flushing.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
a KoninginWilhelmina	Steel	Steam	Dutch	4,262	4,000

By Werf Conrad, Ltd., Haarlem.

* Volshaia 6 ..	Steel	Dredg	Foreign	300	375
* Castor	"	"	"	350	200
* Sofia Royal ..	"	"	"	180	180
* Madagascar ..	"	"	"	200	150
* Amur	"	"	"	320	375
* Shilka	"	"	"	280	80
* N.N. *	"	"	"	130	80
* Batavia	"	"	Dutch	50	20
* Fanagoria.. ..	"	Hop'r	Foreign	250	200
* Tanais	"	"	"	250	200
* Pantihapea ..	"	"	"	250	200
Nos. 1-5	"	Barge	"	150	—
Nos. 1-2	"	"	"	60	—
Nos. 1-5	"	"	"	100	—
* Amazar	"	Stern	"	150	200
* Gasimur	"	Wheel	"	150	200

BELGIUM.

By Societe Anonyme John Cockerill, Hoboken.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
* No. 350	Steel	Steam	Belgium	—	100
* " 351	"	"	Foreign	—	265
* " 352 Princess Clementine	"	"	"	—	8,300
* " 353	"	"	"	—	125
* " 354	"	"	"	—	350
" CLXXXVI. ..	Barge	—	"	—	—
" CLXXXVII.	"	—	"	—	—

FRENCH.

By La Cie des Messageries Maritimes, La Ciotat.

Name of Vessel.	Built of	Class.	Owners.	G. T.	H.P. I.
† Saos	Steel	Steam	French	6,000	7,200

By Les Chantiers de la Seyne.

† D'Entrecasteaux .	Steel&Wd.	Steam	French	5,352	13,500
* Canot Vedette ..	Steel	"	"	6·439	50
* " " ..	"	"	"	6·439	50
Perseverance ..	"	Sail	"	3,063	—
Rhone	"	"	"	3,063	—
Antoinette ..	"	"	"	3,063	—
† France	"	Steam	"	4,198	2,800
* Utile	"	"	"	22	50

DENMARK.

By Burmeister & Wain, Copenhagen.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
* Sleipner	Steel	Steam	Danish	1,000	2,000
† Livonia	"	"	"	2,030	800

By Elsinore Iron Shipbuilding and Engineering Co., Elsinore.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
† Atlas	Steel	Steam	Foreign	987	400
† Pronto	"	"	"	1,363	600
† Gunther	"	"	"	1,447	600
† Regina	"	"	"	2,163	750
† Italia	"	"	"	1,290	800

* Compound. † Triple. a Quadruple.

NORWAY.

By Bergens Mekaniske Værksted, A.B., Bergen.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. N.
† Victoria	Steel	Steam	Norweg.	965	107
† Rio..	"	"	"	691	70
† Hafina	"	"	"	965	107

ITALIAN.

By Geo. Ansaldo & Co., Sestri, Ponente.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H. P. I.
† Cristobal Colon ..	Steel	Steam	Foreign	4475·10	14·000
* Vittoria	"	"	"	24·45	60

* Compound. † Triple.

Miscellaneous.

Torpedo-boat Destroyers.—Messrs. Schichau, of Elbing, are building four torpedo-boat destroyers for the Chinese Government, and, according to the contract, they are to be delivered within 13 months. The engines will be of 6,000 I.H.P. and a speed of 32 knots.

Trial of New Revenue Cutter.—On December 9th a preliminary trial trip was made of the new steel revenue cutter *Walter Q. Gresham*, built by the Globe Shipbuilding Co., of Cleveland, Ohio. The test was very satisfactory, the steamer making nearly 20 miles an hour with four boilers. The *Gresham* is so constructed so that she can be readily transformed into an efficient cruiser in time of war.

Torpedo Boats.—The first of six torpedo boats of the *Viper* type, building by Messrs. Yarrow & Co., of Poplar, for the Chilian Government, ran her official trial on Wednesday, December 16th, and obtained a speed of 26·797 knots per hour, on a three hours' run, carrying a load of 25 tons. The guaranteed speed was 25½ knots. This vessel is 152 ft. 6 in. long by a beam of 15 ft. 3 in. The trial was conducted on behalf of the Chilian authorities by Sir E. J. Reed, K.C.B., Mr. Maurice representing Admiral Uribe, the President of the Chilian Naval Commission.

Brussels Exhibition and British Art.—Sir Edward J. Poynter, President of the Royal Academy, has been informed that Sir Michael Hicks-Beach, as Chancellor of the Exchequer, has been able to comply with the suggestion made by the President to grant £1,500 towards the expenses of the British Art Section at the Brussels Exhibition, which are believed to involve about £4,500. The remainder of the sum will, it is expected, be found by private subscription.

Historical Records.—Mr. Gomer Williams is bringing out early in 1897, a book entitled "A History of the Liverpool Privateers and Letters of Marque," which will create much interest. The author has accumulated a complete history of the ships and men most worthy of permanent remembrance. Master mariners, and all who follow the sea or take a delight in dauntless doings on the ocean, will find in this book a source of amusement, for it deals with facts that are stranger than fiction. Heroic deeds are related, often by the actors themselves, in the simple but forcible language of the sea.

Catalogue.—We have received a catalogue of Mathematical, Surveying and Drawing Instruments from Mr. W. F. Stanley, of Great Turnstile, Holborn, W.C. This seems to comprise every instrument known to the draughtsman, and a great many outside his requirements. Amongst the latter we may enumerate meteorological instruments, race glasses, telescopes, microscopes, cameras, magic lanterns, electric apparatus, drawing materials, office requirements, such as copying presses, and a very large number of kindred matters. The stock is made accessible to the purchaser at a distance by a very complete series of illustrations and by full information as to prices. The present issue contains for the first time a telegrapic reference for the principal articles enumerated, so that the customer has no difficulty in ordering what he requires with the minimum of expense and delay.

NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from November 25th to December 21st, 1896:—

Adams, John H., fleet engineer to the *Vivid*, additional for the *Temeraire*, to date November 21st.

Agnew, John W., staff engineer to the *Pembroke*, additional for the *Dido*, to date November 13th.

Andrews, Harry G., engineer to the *Amphion*, to date January 7th.

Bain, David H. W., assistant engineer to the *Howe*, undated.

Bath, George G., chief engineer to the *Cossack*, to date December 18th.

Beckett, W. H., assistant engineer, has been confirmed in the rank of engineer in Her Majesty's fleet.

Carey, John J., chief engineer to the *Amphion*, to date January 7th.

Faulds, Arthur G. J. (acting), chief engineer to the *Colossus*, additional for the *Renard*, to date November 3rd.

Ford, William J., assistant engineer to the *Amphion*, to date January 7th.

Gale, William H. C., fleet engineer to the *Vivid*, additional for the *Shannon*, to date November 21st.

Giles, Harry L. (probationary), assistant engineer to the *Grafton*, to date December 2nd.

Goldsmith, Henry C., fleet engineer to the *Alexandra*, to date November 25th.

Hatelie, David, engineer to the *Vivid*, undated.

Huddy, John B., engineer to the *Howe*, undated.

Hunter, Robert A., engineer to the *Victory*, to date January 7th.

Laughton, Charles, engineer to the *Victory*, undated.

Lawrence, William G., assistant engineer to the *Research*, to date November 23rd.

Liversedge, H. T., engineer, has been promoted to the rank of chief engineer in Her Majesty's fleet.

Liversedge, Henry T., chief engineer to the *Speedy*, to date October 10th.

MacKean, Arthur J. (probationary), assistant engineer to the *Trafalgar*, to date November 27th.

Marshall, F. W., acting engineer, has been confirmed in the rank of engineer in her Majesty's fleet.

Meadus, William H., engineer to the *Ramillies*, additional for the *Ardent*, undated.

Nicklin, W., fleet engineer, has been placed on the Retired List, with permission to assume the rank of Inspector of Machinery.

North, Caleb J., fleet engineer to the *Warspite*, undated.

Pattison, Alfred R., engineer to the *Victory*, to date October 17th.

Rock, W. B., fleet engineer, has been placed on the Retired List, with permission to assume the rank of Inspector of Machinery.

Walton, John H., staff engineer to the *Victory*, additional for the *Calliope*, to date November 27th.

Whayman, William M., engineer to the *Immortalite*, to date December 2nd.

Whittaker, Frederic G., fleet engineer to the *Howe*, undated.

HOAR & BROWN'S HARDWOOD MARKET REPORT, DECEMBER 21st, 1896.

Teak.—There is still great firmness prevailing, and prices look like advancing to a figure high enough to make business difficult to transact. The demand is good, and reports reach this side that great scarcity of this timber at the shipping ports is a recognised fact. On comparing the deliveries of the last eleven months with those of the same time last year one finds an increase of about 20 per cent. Floating prices for cargoes are higher than smaller shipments arriving by steamer, and the London stocks total about the usual average, and for general purposes may be considered enough. The old and weathered wood which lately made rather a feature in the market has now changed hands, and gone into consumption. Bangkok cargoes afloat are being readily placed at advanced values, but sellers of dock stock have not been so fortunate, as prices for the latter are much below new importations.

Planks.—The difficult feature is to supply against existing contracts, and the departing year will somewhat release those who undertook to deliver at the early figures. There is every prospect of a further rise, and quotations for specially imported sizes are getting too high to secure orders. At present the market is fully stocked with extra-wide parcels, but other ordinary stocks are now reduced to a convenient level, and holders may look for an easy profit.

Mahogany.—The business doing shows no decrease in values, and the position of the market remains firm, large wood especially fetching more than usual. Stocks are not considered heavy against the active demand. Honduras and Mexican.—The larger wood has met with close competition at auction, and the smaller logs have held up to the minimum lately existing.

Minatitlan.—Stocks are not large, and there is plenty of room for business should arrivals be reported.

Teiolutla.—Very little is now held, and a cargo landing, which will shortly be offered, comes at an opportune moment, and will meet with support. Panama.—This should be manufactured sounder than recent importations, faulty and badly-split parcels are not finding willing purchasers. African.—A considerable quantity which has lately found its way into this market cannot be described as mahogany, and consequently ought to be sold under the designation of "furniture wood." Prices are low for this kind, but good mild logs, bearing the mahogany colour and grain, are much sought after, and fetch fairly high figures. Roe and mottled logs are greatly in favour, and are purchased at high rates for reshipment to American dealers. Cuba.—In consequence of continued warfare this wood is getting very scarce, and prices have advanced considerably; there are few outlets for smaller sizes, of which the market principally abounds, the larger sizes have lately been swallowed up, and little or none is left for sale among the dealers. St. Domingo is also running short, and a fresh cargo would find a ready sale.

Cedar.—Honduras, Mexican and Cuba supplies are light, and prices are advancing. Paraguay.—Only one cargo remains for sale, the owners are not pushing it, possibly with a view of an improved market.

Walnut.—Logs are still selling well, and the old, low figures are quite "relics of the past." Planks and boards of low grade are hanging on hand, whereas first-class qualities are selling briskly.

Sequoia.—The demand is moderate, and prices are firm, and a continuance of small stocks will reap a profit for speculators.

Kauri Pine.—A limited business is doing, prices are weak, but still show a small remuneration for shippers.

Greenheart.—There are few enquiries, stocks are ample, and prices appear to be declining.

Whitewood.—Logs are not in demand, boards and planks have lately been selling at lower rates than have been known for years in spite of the increase in freights.

Business cannot be termed as dull throughout, and a still better time is expected with the New Year.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(From our own Correspondent.)

Clyde shipbuilders have launched in the course of the year 97 sailing ships of 46,814 tons, and 280 steamers, measuring 374,027 tons, the total tonnage being thus 420,841, the largest that has ever been known in the history of the trade. The Clyde is far ahead of any other producing centre, turning out more than Tyne and Wear put together. From the table given it will be seen that Messrs. Charles Connell & Co., Scotstoun, head the list with 40,864 tons, as compared with 24,472 tons in 1895. Their total includes one steamer over 6,000 tons gross, four over 4,000 tons gross, and three over 3,000 tons gross. Messrs. Wm. Denny & Brothers, Dumbarton, who were first in 1895 with 35,028 tons, are third on the list with 32,677 tons. Messrs. A. Stephen & Sons, Linthouse, who were tenth on the list last year, rank second, with a total of 35,185 tons. Messrs. The Fairfield Co., Govan, are fourth with 29,987 tons. Their total includes three steamers for the Castle Mail Packets Co., one of about 6,000 tons gross, and two of about 5,600 tons gross for their South African trade and the first-class cruiser *Diadem*. Messrs. Russell & Co., Port-Glasgow, who were third in 1895, are now fifth with 29,116 tons, and Messrs. D. & W. Henderson & Co., Meadowside, are sixth on the list with 28,081 tons; this firm built the *Meteor* for H.I.M. the Emperor of Germany, from designs by Mr. G. L. Watson.

The tonnage of each establishment on the Clyde, and how it compares with last year, is shown in the following table:—

	Total tons	
	1896	1895.
C. Connell & Co.	40,864	24,472
A. Stephen & Sons	35,185	16,731
Denny & Brothers	32,677	35,028
Fairfield Co.	29,987	23,024
Russell & Co.	29,116	29,488
D. & W. Henderson	28,081	24,504
Barclay, Curle & Co.	26,223	15,316
London & Glasgow Co.	23,221	20,440
Caird & Co.	20,842	19,415
Scott & Co.	18,638	26,406
Hamilton & Co.	15,855	3,257
M'Millan & Son	12,450	6,560
R. Napier & Son	12,100	6,600
A. Rodger & Co.	11,504	9,813
J. & G. Thomson	10,492	32,197
Lobnitz & Co.	8,479	10,961
Simons & Co.	8,260	6,600
Mackie & Thomson	7,468	4,176
Fleming & Ferguson	6,000	5,400
A. & J. Inglis	5,033	8,482
Ailsa Shipbuilding Co.	4,943	3,525
Campbeltown Co.	4,385	3,092
John Reid & Co.	3,911	3,033
Alley & M'Lellan	3,300	1,856
Murdoch & Murray	3,221	710
D. J. Dunlop	3,010	5,080
R. Duncan & Co.	2,677	2,615
Scott & Sons	2,607	2,150
Blackwood & Gordon	2,425	1,806
Fullerton & Co.	1,864	1,011
Napier, Shanks & Bell	1,861	1,793
Ritchie, Graham & Milne	1,593	451
Minor firms	3,569	4,160
	420,841	360,125

Coming now to the amount of work on hand, there is sufficient on the stocks to keep the majority of the yards as actively engaged as they are at present until close on the Glasgow Fair holidays; according to estimates there is about 300,000 tons, 150,000 tons of which is in the lower reach. The vessels on hand are chiefly for the merchant service, though here and there are steam yachts of the better class and screw and paddle steamers intended for purely passenger services. Of the Government contracts, Clydebank, with the *Jupiter* rapidly approaching completion, has most; but Fairfield is also busier on warships than on merchant vessels, and the *Isis* is still at Govan.

Messrs. The Caledon Shipbuilding and Engineering Co., Limited, Dundee, have, besides the vessel mentioned in our list, built a small steamer for Calcutta owners—Length, 110 ft.; breadth, 15 ft.; depth, 10 ft., with engines of 300 I.H.P., which they are sending out to Calcutta in sections, and a steamer of about 800 tons, which will be launched shortly.

Messrs. William Simons & Co., Limited, Renfrew, have constructed during the year engines and boilers of 650 I.H.P. and a large quantity of dredging machinery for home and foreign ports.

Messrs. R. Napier & Sons, Lancefield, Glasgow, supplied the engines, of 1,000 N.H.P., for the *Yucatan* and *Tehuantepec*, built by A. McMillan & Son, Limited.

Messrs. S. & H. Morton & Co., Victoria Docks, Leith, have executed a large amount of machinery repairs, and fitted new triple-expansion engines and boilers to the s.s. *Golden Prince*, also tripled the engines and supplied new boilers to the s.s. *Iona*, belonging to the London and Edinburgh Shipping Co., these engines on trial indicated 3,350 H.P. They have also been engaged with the construction of new triple-expansion engines and boilers to indicate 1,400 H.P. for the *Amatel*, of Leith.

Mr. James Adam, Gourock, is building to the order of E. Ramsey, Esq., a new fishing boat, built of teakwood, with cabin forward, two holds, with three watertight bulkheads and fitted with all the latest improvements. She is the first built for a new fishing industry at Cape Town, South Africa. Mr. Adam has also a large trade in docking and repairing yachts.

Messrs. John Cran & Co., Leith, have completed several very large repairs to vessels in dry dock throughout the year, and they have at present on hand five pairs of new engines and one tug vessel.

Messrs. Scott & Co., Greenock, have on hand two sailing vessels, each of 3,800 tons carrying capacity, also twin-screw engines of 13,500 H.P. and Belleville boilers for H M. first-class battleship *Canopus*, building at Portsmouth Dockyard.

Messrs. Hall, Russell & Co., Aberdeen, are building two screw steamers, a steam trawler and two steam line boats, total gross tons register, 5,325; I.H.P. 5,540.

Messrs. Blackwood & Gordon have during the year carried out very extensive alterations to hull, engines and boilers of steam yacht *Zuhora* for his Highness Rajah Brook, of Sarawak, and a number of other yachts and steamers, both on their slip and wet dock. They have on hand the steel screw passenger steamer *Kerry*, of 1,274 tons gross, and 3,500 I.H.P., for Messrs. The City of Dublin Steam Packet Co., for their Dublin and Liverpool trade, and two sets of triple-expansion engines and boilers, each to indicate 1,500 H.P., for Messrs. Russell & Co., Port-Glasgow.

Messrs. Jas. Howden & Co., engineers, Glasgow, who now restrict their operations entirely to their forced draught business, have done a very large amount of work during the last year, having up to 30th November last contracted to supply 120 steamers with forced draught installations. These have been chiefly large steamers, their aggregate power amounting to 357,900 I.H.P. This number does not include the steamers contracted for under license in America, where also a large number have been fitted with the Howden system.

The manufacture of the firm is confined to the apparatus required for their forced draught system, fans and engines, furnace fronts, and spiral retarders. They supply these articles with plans for each installation to the various engineering firms contracting for the machinery for the steamers.

Their system of forced draught is now almost exclusively used in mercantile steamers all over the world, it being now fitted in steamers having an aggregate of 1,333,500 I.H.P.

Messrs. Mackie & Baxter, Copland Works, Govan, Glasgow, who only began operations on the 1st of August last, have completed three sets of marine engines, and have seven other sets on hand, making up a total of 1,900 I.H.P. They have also contracted to build a full powered sea-going tug.

An analysis of the Clyde marine engineering returns show a considerable improvement over that of the previous year. In 1895, machinery was constructed amounting to 333,490 I.H.P. and 1,437 N.H.P., but the work of the past year amount to 427,759 I.H.P., an increase of over 90,000 I.H.P. The following is a summary of the work done: 1896. 1895.

	I.H.P.	I.H.P.	N.H.P.
J. & G. Thomson	50,850	50,720	
Denny & Co	44,000	30,400	
Fairfield Co	35,650	35,200	
London and Glasgow Co.	28,150	16,800	
A. Stephen & Sons	25,380	10,785	
Caird & Co.	22,500	14,200	
D. Rowan & Son	20,820	9,350	
D. & W. Henderson	20,360	23,000	
Muir & Houston	20,350	11,000	
Barclay, Curle & Co.	15,500		1,437
Scott & Co	15,000	18,350	
Dunsmuir & Jackson	14,265	19,955	
Lobnitz & Co	12,850	7,890	
Bow, M'Lachlan & Co.	12,080	6,440	
A. & J. Inglis	11,820	8,400	
R. Napier & Sons	10,100	5,700	
Ross & Duncan	10,000	8,370	
Fleming & Ferguson	9,700	12,100	
Simons & Co	9,425	8,975	
Kincaid & Co	8,680	2,110	
Rankine & Blackmore	5,190	4,410	
D. J. Dunlop & Co.	5·100	4,600	
Blackwood & Gordon	5·000	4,170	
Hutson & Son	4·400	6,200	
Hall-Brown, Buttery & Co.	4·125	3,075	
Alley & M'Lellan	4,000	2,730	
Minor firms	1,464	8,560	
	427,759	333,490	1,437

A satisfactory settlement was come to during the month between the Amalgamated Society of Engineers and the Employers' Federation. A meeting was held at Carlisle on November 26th, of the Executive Board of the Engineering Employers' Federation, for the purpose chiefly, though not altogether, of considering the wages questions on the Clyde and in Belfast. The conference opened shortly before two o'clock, and lasted for a couple of hours. All the questions were discussed, and the decision communicated to the A.S.E. on the following Saturday, who forwarded it to the secretary of the district committee. The employers' offer is an advance of ¼d. per hour, or 1s. per week as from the 12th December, the rate to stand for six months, with one month's notice by either side of any desire to alter it, to be conditional on its acceptance by all the districts concerned; and in reference to the working hours from 54 to 53 per week, they could not entertain the idea of a reduction. The Greenock, Port-Glasgow, and Paisley members of the Amalgamated Society of Engineers accepted the advance. but the Glasgow committee was divided on the subject of the working week, and after two meetings it resolved to refer the whole question to the men in a ballot. On December 10th the votes of all the 25 branches were counted at the central rooms of the A.S.E., when there was a majority of over two to one in favour of accepting the Federation offer. Mr. Reid, the secretary of the district committee, was instructed to formally accept the offer of the masters.

The dispute of engineers at Johnstone was settled the early part of the month. The employers agreed to grant immediately an advance of a shilling a week, and after December 30th a further increase of a shilling to all engineers who are at present receiving 31s. a week and under. This arrangement holds for six months.

Important contracts were placed on the Clyde by the British Government on December 10th, the Fairfield Co. receiving orders to build two second-class cruisers and the London and Glasgow Co. one. The vessels are to be exactly similar to the *Venus* and *Diana*, built by Fairfield, and the *Isis* and *Doris* built by the London and Glasgow Co. But in respect of propelling machinery they will have the Belleville water-tube boiler with economiser, and 4-cylinder, 4-crank triple-compound engines. There are to be 18 boilers, whereas in the *Venus* class there were 8 of the single-ended cylindrical type. The boilers are to be placed in three compartments, and there are to be three funnels instead of two: but while the Belleville boilers will occupy more of the length of the vessel, they will have a higher steaming efficiency. Each of the boilers will contain nine elements, each having seven pairs of large tubes, while over that is to be a combustion chamber, and over this chamber again a series of nine elements, each having seven pairs of small tubes. Thus each boiler will have 126 large and 126 small tubes, all of solid drawn metal; the 18 boilers having in all 4,536 tubes. The total heating surface is to be just over 24,000 square feet, while the combined area of the fires of all the boilers is to be 750 square feet. There will, of course, be but one furnace to each boiler, but two doors; and it is the large grate area which involves the careful stoking that proved so advantageous in the *Powerful's* trials. The steam pressure is to be 300 lbs. at the boiler, and 250 lbs. per square inch at the engines; the high pressure cylinders will be 26 in., the intermediate 42 in., and there will be two low-pressure cylinders, each 48 in. in diameter, and the stroke 30 in. The engines will run at a high speeed of 180 revolutions per minute. The propellers will be three-bladed. The armament will consist of eleven 6 in. guns, eight 12-pounder guns, and six machine guns, principally for the military tops, and three submerged torpedo-launching tubes. The hulls will be practically the same as in the *Venus* class. The cost of these new vessels is £236,000 each, which works out at £42 per ton displacement. These warships complete the order provided for in the Naval programme for the current year.

Messrs. Russell & Co., Port-Glasgow, have received an order to build a three-masted steel sailing barque of 2,800 tons carrying capacity for British owners, and another of 2,850 tons deadweight for Messrs. R. Shankland & Co., Greenock. Two sailing ships being built by them in Kingston Yard on their own account have been sold—one to Greenock owners, and the other to the Australian Ship Co.

Messrs. Alexander Hall & Co., shipbuilders, Aberdeen, have received orders for the construction of a trawler to cost over £4,000, from Mr. W. Dodds, Aberdeen, and a steam liner from Mr. Lundy, Aberdeen.

Messrs. The Fairfield Shipbuilding Co. have received an order for a large first-class passenger steamer from the Roumanian Government, they are also laying down the keel of the new steamer, which will be 520 ft. long, and the largest steamer in the Currie Line.

Messrs. Scott & Co., Greenock, have contracted to build for Mr. William Clark, Largs, a large steam yacht to take the place of the *Mohican*, sold to the German Government. She is to be elaborately fitted up, and is to the design of Mr. G. L. Watson.

Messrs. James & George Thomson, Limited, have contracted to build for the Spanish Government two more torpedo-boat destroyers, this makes six vessels of the type under construction at Clydebank for the Spanish Navy.

Messrs. D. & W. Henderson, Meadowside, have secured a contract to build for the Anchor Line a steamer of about 6,000 tons.

Messrs. Robert Napier & Sons, Lancefield, Glasgow, have received an order for a large first-class passenger steamer from the Roumanian Government.

Messrs. The Grangemouth Dockyard Co. have contracted to build for the Nova Scotia lumber trade a steel sailing vessel of 1,000 tons.

Messrs. Robert Duncan & Co., Port-Glasgow, have sold the sailing vessel which they were building to the Eastern Shipping Co., Liverpool, and her construction is being rapidly proceeded with.

Messrs. A. & J. Inglis, Glasgow, have contracted to build two steamers, a passenger boat, and a cargo vessel—one is for the Bristol Steam Navigation Co., the other for Newfoundland owners.

Messrs. J. G. Rowan & Co., Greenock, have received an order for the upholstery work of the two passenger steamers the Naval Construction and Armaments Co., Limited, Barrow, are building for the Great Western Railway Co.

The gates at the Port-Glasgow Graving Dock are so much decayed, that at a special meeting of the Harbour Trust it was decided to proceed with the construction of new gates, and it is estimated that the cost will not be under £800.

The second general meeting of the fortieth session of the Institution of Engineers and Shipbuilders in Scotland was held on November 24th in the hall of the Philosophical Society, Bath Street, when a discussion took place on a paper by Mr. A. Morton on "The Maximum Elasticity and Density of Steam"; Sir William Arrol, M.P., presided.

The master of the s.s. *Fire Queen* was charged and found guilty of a breach of the launching by-laws, in so far as he passed up the river disregarding signals for him to stop while the s.s. *Anping* was being launched from Messrs. Connell's yard at Scotstoun. A penalty of £3 3s. was imposed.

TRADE NOTES FROM THE TYNE, WEAR, TEES, HARTLEPOOLS, &c.

(*From our own Correspondent.*)

THE TYNE.

Shipbuilding.—From the returns to be found in another part of this journal, it will be seen that the shipbuilding output of the United Kingdom for the year 1896 exceeds that of the preceding year, and of any previous year, with the single exception of 1889. Notwithstanding this very prominent fact, the year has not been an unprecedentedly busy one; for it was not till the last quarter that a marked improvement in the demand for tonnage set in. During the first half of the year a number of yards on the Tyne and Wear were at the extreme of slackness, while at those usually busy centres—the Tees and the Hartlepools—comparatively little was done, the state of business in the leading yards showing a falling off as compared with the condition of affairs in the corresponding portion of 1895. The truth of this will be seen when it is considered that the output of Sir Wm. Gray's yards was less by over 20,000 tons in 1896 than in 1895; that Messrs. Ropner's establishment at Stockton shows a diminution of 6,000 tons; Messrs. Richardson, Duck & Co. a decrease of nearly 8,000 tons, and Messrs. Craig, Taylor & Co. one of over 2,000 tons. In one or two instances an increase was shown; but these increases, put together, were by no means sufficient to make up for the deficiencies noted. It is evident, therefore, that the district of the Tees and Hartlepools contributed nothing to the increase of output in 1896, although one firm adopted the somewhat novel method of augmenting their production by entering a figure very much in excess of the gross register tonnage, in respect of every vessel they built. Almost the whole of the important firms on the Tyne and Wear, and also on the Clyde, have very largely increased their output in 1896, many of them having more than doubled the production of the previous year. Still it must be confessed that until October the shipbuilding centres of the country were not so uniformly brisk as could be desired, and keeping that feature in view, the exceptional largeness of the aggregate output can only be explained by the circumstance that the more enterprising firms have, by the adoption of improved methods and appliances, greatly increased the productive capacity of their establishments. The increase in the size of vessels may also be taken as a reason why an exceptional output can be produced without proportionately exceptional briskness; for practical men will understand that there is more work in the building of two 3,000-ton boats, than in the building of one 6,000-ton vessel of the same type.

Though, as we have stated, there were yards on both the Tyne and Wear which had little or no work during a large part of the year, it is not to be denied that all the firms of note on both rivers had an abundance of work the whole time—hence the large increase on the Tyne of 72,835 tons, and the still larger one on the Wear, of 84,249 tons launched, as compared with the preceding year. Vessels of war have helped to swell the Tyne return of output this year, the aggregate tonnage of battleships, cruisers and torpedo destroyers launched being approximately 34,000 tons, over 32,000 of which was contributed by Sir Wm. Armstrong, Mitchell & Co., who have two large yards at Elswick and Low Walker respectively. The firm also launched about 22,000 tons of merchant ships, including a great ferry steamer of over 5,000 tons, two caissons and a floating dock. The joint output of war and merchant vessels figures up to the large total of 54,157 tons, which is more than double the average output of former years, since the amalgamation in 1882. The whole of the warships built by this firm in 1895, with the single exception of H.M.S. *Pactolus*, a cruiser of 2,200 tons, were for foreign Governments, the largest being the *Yashima* for Japan, and the *Esmeralda* for Chili. The Government of the latter country have had a second warship—the *Ministro Zentono*—built at Elswick during the year, and their neighbours, the Brazilians, have also had two ships turned out from the same establishment. At the time of writing both the yards belonging to this great firm are as busy as they can well be, night work being maintained at the Elswick establishment not only in the inside departments, but outside, by the use of the electric light. The whole of the fifteen building berths at the disposal of the firm are occupied with vessels in course of construction, and with the exception of an oil steamer at the Low Walker establishment all of them are for war purposes.

Messrs. C. S. Swan & Hunter show an output for the year of close on 40,000 tons, and are sixth on the list of the hundred or more shipbuilding firms of the United Kingdom whose returns of output have been published. Among the vessels launched by them during the year was one of 8,820 tons, and two others of over 4,000 tons each. One of the latter was a vessel of special design, and very superior equipment, which was ordered by the Pacific Steam Navigation Co. This, it may be stated, is the first vessel supplied to this old-established company by East Coast builders, and we are pleased to say that it is not to be the last, as Messrs. Swan & Hunter have been favoured with an order for a duplicate of the vessel here referred to. This is no small compliment, and speaks volumes for the capabilities of this firm to meet the highest requirements in shipbuilding. They have now on the stocks a vessel of 12,500 tons capacity, and have recently contracted for the building of a large floating dock, which is to be laid down in the unoccupied yard adjoining, which formerly belonged to Messrs. Schlesinger & Davis. The reason for the latter course is that there is no room in either of the firm's own yards, in which there are eight vessels—all of large dimensions—now in progress. The firm are increasing the length of their covered berths to 500 ft., and are in other respects still further adding to the productive facilities of their establishment.

The Palmer Co. this year occupy third place in the return of Tyne output, and tenth in that of the United Kingdom. They have launched five torpedo destroyers which, though replete with intricate details requiring special care and elaborateness of execution in the work, have made but a small addition to the year's output. Among the other vessels built by them were four passenger-cargo steamers for the Hamburg-American Co., and these, having been built on fine lines and furnished throughout with the best accessories of the day, are vessels which cannot but reflect credit on the district where they were produced. In addition to their blast furnaces, iron and steel rolling mills, engine works, and shipyards, the company have during the past year entered upon the manufacture of cycles and motor cars, in which branch of industry it is to be hoped that will achieve success.

Messrs. Hawthorn, Leslie & Co. have launched over 26,000 tons of shipping this year, and would probably have done more, but for the circumstance of having torpedo destroyers in hand. Most of the vessels launched by them were for special trades and of very large dimensions. This firm has recently contracted to build a couple of moderate sized oil-carrying steamers to trade between the ports of the Caspian, and it is understood that they have also secured other work of a more than ordinarily important class. Messrs. Wigham Richardson & Co., whose output amounted to 24,257 tons, had among the ships launched three of very large size, namely the *Elizabeth Rickmers*, the *Coro-coro*, and the *Neidenfels*. The first was for the Rickners Co., of Bremen, the second, for the Pacific Steam Navigation Co., and the third, for the well-known Hansa Co., of Bremen. All of them were vessels of superior type and equipment.

Very exceptional briskness has existed throughout the year in the repairing department at Messrs. Readhead's works, and the circumstance may, to some extent, account for the fact that they are the only Tyneside firm of standing whose output was less in in 1896 than in 1895. Their output in the year now closing was 22,541 tons, and among the vessels launched was one —the *Trojan Prince*—which must rank among the finest specimens of shipbuilding as yet turned out on the Tyne. It is intended to carry goods and passengers between Europe and South America, and is the latest addition to the well known "Prince" line of steamers. The Tyne Shipbuilding Co. have launched five ships, the aggregate tonnage of which amounts to 17,691 tons. Among them was the *Oldfield*, ordered by Messrs. Hunting & Son, of Newcastle, for the bulk petroleum trade, in which she has been very successfully engaged since her completion. She is the third vessel of the same type supplied by the Tyne Shipbuilding Co. to the owners named. Messrs. Wood & Skinner and Messrs. W. Dobson & Co., both have increased outputs this year, and the greater part of the last named firm's production consisted of ships for foreign owners.

Messrs. Edwards Bros., of North Shields, built during the year no less than twenty-nine vessels, twenty-seven of which were trawlers—the aggregate tonnage of which amounted to 4,563 tons. The building of so many vessels—though of a small class—in twelve months, must have involved the maintenance during the whole time of very exceptional activity in the yard, and we question if any other firm engaged in the same class of work has ever shown such a result for a year's working.

Repairing work has been fairly plentiful on the Tyne throughout the year, among the most important contracts carried out being the restoration and alteration of the New Zealand Steam Navigation Co.'s boat *Aoranga*, by Messrs. C. S. Swan & Hunter. This large vessel, which, we understand, is now the property of Messrs. Huddart, Parker & Co., Melbourne, is being fitted with new engines of exceptional power by the Wallsend Slipway & Engineering Co., and is meant to attain in her new career a high rate of speed—also to be provided with all modern accessories to promote the comfort of passengers, and the economical working of cargo.

Engineering.—As the marine engineering work on the Tyne must necessarily have kept pace with the shipbuilding during 1896, as in other years, it follows that a large increase in the volume of work done is to be noted in connection with the former branch as well as with the latter. The engines actually turned out represent H.P. amounting to the enormous total of 222,687. This must be very much in excess of the work done in any former year, and we are pleased to say that there is likely to be a repetition of the achievement in 1897. The whole of the marine engine works are now well supplied with orders, and in most cases night work is being resorted to. Double shift would be general by now, but for the fact that labour of the kind required is scarce—so scarce, indeed, that at several works there are not enough hands to keep the machinery going through the ordinary hours of day work. At the Elswick Ordnance Works business is almost unprecedentedly brisk, and the hands employed in most departments are required to work overtime. Iron foundries are very actively employed, and the same may be said of brass and copper works, while forges are kept at high pressure speed.

Messrs. Thos. Proctor & Son have commenced operations in their recently acquired works at Gateshead, some particulars respecting which we hope to give in an early issue. All that need be added at present is that the firm have a prospect of an excellent year's work in their special line of ships' ventilators, tanks, signal lamps, &c.

In boiler and steam pipe covering Mr. W. F. Snowdon has had a busy year. Among the contracts carried out by him were the boilers and steam pipes of the splendid Russian steamer, *Kherson*; also those of the *Czarovitch George* and the *Grand Duchess Zenia*, the Spanish steamer *Rivas*, the s.s. *Royal Dane*, the s.s. *Tynesider*, the s.s. *Russia*, the s.s. *Ouse*; the steamers *Oldfield*, *Port Darwin*, and *Leitrim*; as also those of the *Maritta*, the *Mogul*, and the *Cowrie*. The freezing installations were covered in the large meat steamers *Waimate* and *Naarung*, and an extensive covering job was also carried out on the Chilian troopship *Angamas*, on her arrival in the Tyne with crews for new warships. This firm have also carried out important contracts at the yards of Sir Wm. Gray, West Hartlepool, and Messrs. Armstrong, Mitchell & Co., Low Walker, at both which establishments the whole of the boilers and steam-pipes were covered.

In last month's Trade Notes it was stated that Messrs. Noble & Lund, of the Northern Machine Tool Works, Felling, were supplying to Messrs. Edwards & Sons, of Shields, a lathe for turning large shafting, which, when completed, would weigh 40 tons; and it was added that a table to bear a 20-ton ingot was attached. The latter statement was made inadvertently, and is obviously incorrect. The table to carry steel ingots of 20 tons weight belongs to the large band saw which the firm are supplying to a steel works near Glasgow, and to which reference was made in the same paragraph.

Blyth.—The Blyth Shipbuilding Co. only launched one vessel during the year; but a large amount of repairing work was done in the graving dock department, and this, no doubt, would make up for the smallness of the output in new work. The Blyth Dry Dock Co., Limited, have also had a number of important repair contracts to deal with during the year, and have seldom been without having one or both docks occupied. The construction of the third dock—which will be one of the largest on the North East coast, and capable of accommodating almost any vessel—is being steadily proceeded with, and will be ready for opening by the time originally anticipated.

THE WEAR.

Shipbuilding.—It came as a surprise to most people that the firm of Messrs. J. L. Thompson & Sons, who, for seven consecutive years held the leading place in the returns of shipbuilding output on the Wear, were this year placed second, having been headed by Messrs. Doxford by something over 2,000 tons, the actual figures in each case being 37,323 tons and 39,533 tons. Each firm launched the same number of vessels, but one launched by Messrs. Doxford had a gross register tonnage of 7,574 tons, and it was this ship, no doubt, that gave the latter firm the lead. Messrs. Doxford's output is very little less than Messrs. Swan & Hunter's, of the Tyne, who stand sixth on the list of the United Kingdom returns, and who have beaten such firms as Messrs. Workman & Clark, Belfast, Sir Raylton Dixon, Middlesbro', and all but one firm on the Clyde. The "turret" type, introduced by Messrs. Doxford some four years ago, has now achieved a distinct success, and its popularity largely tends to account for the big increase in the firm's output. Other types of steamers have during the past year come into existence as rivals to the "turret," but it remains to be seen whether any of them embodies an improvement upon the original idea. Until improvement is established in one or other of the later types it is, we think, only natural that in the opinion of experts the design which marked the first departure from the old and commonly accepted methods, should have precedence.

Of the vessels launched by Messrs. J. L. Thompson & Son five were for foreign owners, three of the latter ships being of special design, large size and exceptionally superior equipment. These vessels are in every way creditable to the builders, and cannot fail to enhance their already well-established reputation for high-class work.

Messrs. Short Brothers have launched twelve vessels during the year—one each month—which is a highly creditable performance, when it is considered that the firm have used only four building berths. Since the acquisition by the firm of the adjoining premises, formerly occupied by the North of England Shipbuilding Co., they have been provided with room for putting down three more vessels should the need arise, but up to the present they have not been put to the necessity of utilizing the additional berths. It may be stated here that the s.s. *Truma*, a vessel of about 1,600 tons register, was built by the firm in a little under fifty working days from the laying of the keel to the launching. To build a vessel of that size in less than two months is, we think, a very smart achievement, and one which shows the capacity for prompt execution that distinguishes the firm. Electrical plant has been put down for driving the yard machinery by motors, and for lighting purposes. The motors wherever they have been placed have been found to work most efficiently, and the enterprise exhibited by the firm in entering upon this new departure will doubtless be justified by results.

Mr. Laing, of the Deptford yard, does not figure very conspicuously in the output returns this year, though eleven steamers were launched from the yards. They were almost all of superior and special types, however, involving a great amount of detail work of a costly and intricate character. Four of the vessels were twin-screw boats ordered by a Russian company; two were passenger vessels for the South Africa trade, and one —ordered by Messrs. Huddart, Parker & Co., Melbourne—was for Australia. Mr. Laing adopted during the year the system of "joggled" or indented plating, to admit of "packing" being dispensed with, which was introduced by Messrs. Doxford a couple of years ago. Only one of the vessels launched in 1896— the *Oscar II.*—has been plated in accordance with this system; but the principle is being applied to the vessels now on the stocks, and it is quite evident that the day of "packing," which —to put it in a simple form—implies weight without strength, is over and done with at the Deptford establishment. The *Oscar II.*, it should be stated, is a "trunk" steamer, respecting the performances of which, exceptionally good results are anticipated.

Nearly all the other yards on the Wear show an increased output in 1896, the increase of the Sunderland Shipbuilding Co.'s production of tonnage being exceedingly satisfactory as compared with their output in 1895. During the year two vessels—the *Flintshire* and *Naarung*—were launched from the company's yard, either of which would do credit to any firm of builders both as regards workmanship and equipment. They have built some smaller vessels of a special type also during the past twelve months, and have now commenced to lay down a superior boat for a Marseilles company, which is to have a speed of seventeen knots, and is to be handsomely fitted up for the accommodation of passengers.

Repairing work has been fairly plentiful during the greater part af the year, Messrs. J. L. Thompson & Sons, and Messrs. Short Bros. being large participators in this branch of business. The former firm possesses splendid repairing and fitting-out accommodation at their Manor's Quay Works, and the latter firm are about to adapt recently acquired premises to similar purposes.

The building of wood boats for ships had practically ceased during a part of the year, and it was towards the close of the last quarter that any sign of revival was apparent in this decaying industry. Even then the improvement was not much to speak of, and only one or two of the principal shops succeeded in getting any work.

Engineering.—That business has been in a fairly satisfactory state throughout the year in the Sunderland engineering establishments, is shown by the returns of engines fitted, which are considerably in excess of any former year since the beginning of the present decade. Messrs. George Clark, Limited, show the largest output of work in 1896, and are still extremely busy in all departments. The Palmer's Hill firm (Messrs. John Dickinson & Sons), though they do not head the list in the matter of H.P. turned out, show the excellent result of having engined in one year no less than eighteen new vessels, as well as fitting an old one with practically new machinery. The North-Eastern Engineering Co., South Dock, have been largely engaged during the year in engineering vessels of a small class but they have also had some large vessels to fit with machinery, and on the whole show a capital result for the year's operations. The company, some months ago, made a considerable exension in their boiler department, and now they have erected a new pattern shop in proximity to the foundry.

One of the most interesting events of the year is the opening of the electrical department of the Sunderland Forge and Engineering Co.'s works. A new building of considerable extent has been provided, and a full equipment of the best modern plant has been put down, with a view to enable the management to deal with electrical contracts of all kinds in the most effective and economical manner. The establishment, it may be added, is already full of work and is not likely to show any indications of slackness for a long time to come.

The Hartlepools.—Having already referred to the state of shipbuilding at the Hartlepools during 1896, we need not again enlarge upon it; but to what has been said we may add, that during the latter half of the year Messrs. Irvine & Co. have been incapacitated from carrying on shipbuilding or repairing work, owing to the very extensive alterations they have decided to make—and which are now in progress—in their shipyard and graving dock. The firm are determined to be up-to-date in their arrangements, and no one will question the wisdom of that decision.

At the Central Marine Engine Works, West Hartlepool, eighteen sets of engines with boilers have been turned out during the year, besides which sixteen other marine boilers have been constructed at the works, or a total of 52, all the boilers being of large size, and generally constructed for high pressures. The most powerful set of machinery made during the year was for the s.s. *Cambrian*, built for the Wilson's Furness-Leyland line, the cylinders in this case being 32 in., 54 in., and 86 in. by 54 in. stroke, and the set is the largest yet constructed at the Hartlepools. The first set, constructed of Mudd's patent five-crank engines, was fitted in the large steamer *Inchmona*, and the incident aroused great interest at the time among shipowners and engineering experts. The quantity of work turned out during the year is unfortunately below the average of recent years, but this is not the only establishment that has shown some retrogression in the matter of output. The work now in hand will fully occupy the first six months of next year, and though the demand has now perceptibly lessened, the requirements of shipowners having been for the time being apparently satisfied, the expectation remains that sufficient new orders will be booked to keep the works steadily going to the end of the year. The s.s. *Laristan*, which was engined at the works, went on her trial trip on December 2nd from West Hartlepool. Built by Sir Wm. Gray & Co., to the order of Messrs. Strick & Co., of Swansea and London, the vessel takes Lloyd's highest class, the dimensions being 300 ft. by 42 ft. and 21 ft. 9 in. The deck erections consist of a full poop, a bridge over the machinery space, and top-gallant forecastle. A handsome saloon and cabin have been fitted up aft for the accommodation of the officers, while the crew are to be berthed forward, and the engineers on the bridge, where suitable rooms have been provided. The vessel is built on the web-frame system, with cellular double bottom, large tank aft, large hatchways, five steam winches, steam steering gear amidships, and hand gear aft, large donkey boiler, patent direct steam windlass, boats on beams overhead, shifting boards, stockless anchors, and two masts, with schooner rig, being in every way equipped in the most complete manner as a first-class modern cargo boat. The engines are triple-expansion, and have cylinders 21½ in., 35 in. and 58 in. by 39 in. stroke, and the boilers work at a pressure of 160 lbs. per square inch. After the adjustment of compasses the vessel ran out to sea for an hour, the machinery working during the run to the entire satisfaction of the officials on board. The trial was witnessed by Capt. Rosser and Mr. A. Walker (under whose superintendence ship and machinery were constructed), and also by Capt. Bristow, of the Wilson-Furness-Leyland line, and by Capt. Murrell and Mr. Mudd, representing the ship and engine builders respectively. After the trial the vessel proceeded to one of the Welsh ports to load.

Stockton.—Messrs. Ropner & Son have during the year introduced a new type of cargo steamer under the patent of Mr. R. Ropner, junr., which is called the "trunk" steamer, from the fact that a "trunk" to facilitate cargo stowing and strengthen the ship is provided in the structure, and runs throughout the greater part of the vessel, fore and aft. Two vessels of this type have already been launched, and orders for others have been booked. With a view to meet the increasing demand for greater length in ships, this firm have decided to lengthen their building berth, and for that purpose have recently purchased suitable property adjoining their yard.

Middlesbro'.—Messrs. Raylton & Sons will commence the year with a good deal of work in hand, and Messrs. Cragg & Son, who in the early part of the year removed their business to larger and more suitable premises, are also in a position to begin the year with a good prospect of being kept busy to the close.

Darlington.—The Darlington Forge Co. have had a very successful year, and have completed a great many contracts for war and passenger vessels, giving in every case the greatest satisfaction. The company have excellent prospects for the coming year, the orders in hand being sufficient to tide over a considerable portion of the period.

Consett.—According to a recent ascertainment, the wages of steel millmen at the Consett Iron and Steel Works, will, under the sliding scale arrangement, remain the same as at present during the first quarter of 1897.

THE MERSEY.

(*From our own Correspondent.*)

APART from a temporary depression during the first few weeks of the year, caused by the disturbed outlook abroad, and an unexpected protraction of the serious wages disputes in the important shipbuilding centres of the North, the past twelve months has been a period of exceptional activity in all branches of the engineering trade, and of substantial improvement throughout the iron market, prices having advanced steadily without speculation, and the outlook with the close of the year is marked by a feeling of general confidence with regard to the future.

The marine engineering industries of the district both as regards shipbuilding, boiler-making, and machine-tool making have all been kept fully employed, and the leading Manchester firms have been exceptionally busy upon heavy tools specially designed for various branches of marine work. The shipbuilding industry on the Mersey is now chiefly confined, so far as important work is concerned, to the Birkenhead side, and the following vessels have been completed by Messrs. Laird Brothers during the past year:—H.M.S. first-class battleship *Mars*, steel twin-screw, 8,000 gross tons register, triple-expansion engines, 12,000 I.H.P., 17 to 18 knots per hour; *Almirante Simpson*, a cruiser, for a foreign Government, with 610 gross register, 4,500 I.H.P. 21½ knots; *Capitan Orella*, *Capitan Munoz Gamero*, *Teniente Serrano*, and *Guardia Marina Riquelme*, foreign torpedo boat destroyers, each 320 gross tonnage, 6,000 I.H.P., and 30 knots; the *Ulster*, *Leinster*, *Munster*, Irish-mail boats, with 2,632 gross tonnage, 8,500 I.H.P. and 23 knots; paddle boat for river service, 200 gross tonnage, horizontal non-condensing engines, 200 I.H.P.; H.M.S.'s *Earnest*, *Griffion*, *Locust*, and *Panther*, torpedo-boat destroyers, 320 gross tonnage, 6,000 I.H.P., and 30 knots. During the month the destroyers *Quail* and *Thrasher* have passed their three hours' coal consumption trials at over 30 knots speed, and the first of the Irish mail boats has attained 23 knots per hour on preliminary trial.

In the general engineering branches the leading firms commenced the year with their books well filled with orders, and new work has been coming forward in increasing quantities, machine-tool makers in all departments being exceedingly busy both on home and foreign accounts. Stationary engine builders have also been full of work both in the heavy and light branches, makers of small engines specially adapted for electrical requirements being exceptionally busy. Amongst boiler-makers, although perhaps the pressure has not been so great as in other departments, there has been no scarcity of work to keep this important branch of Lancashire industry fully going. In the locomotive building trade, which had been for several years past in an exceptionally depressed condition, there has been a large amount of work giving out, which in some cases will keep firms fully employed over next year, and much the same remark applies to general rolling plant for railway requirements, carriage and waggon builders having also a considerable weight of work in hand. The revival of activity throughout the engineering trades has of course not been lost sight of by the workmen, and there has been a general upward move in wages, averaging 2s. per week, which for the most part has been secured without any very serious conflict with the employers. The following list of places where advances have been actually conceded will show the extent of the upward movement in wages: Bolton, Manchester, Bury, Radcliffe, Ramsbottom, Haslingden, Blackburn, Preston, Rodley, Burnley, Nelson, and Colne, 2s. per week; at Lancaster 1s. to 2s. per week, and 53 hours' week; Wigan, 2s. per week advance in pattern-makers' wages. In the following districts advances have been partially conceded, but in some cases questions are still pending:—Rochdale and Heywood, 2s. per week, and 10 per cent. on piece-prices; Stockport, Newton-le-Willows, and Earlestown, 2s. per week.

In the iron market during the early part of January apprehensions of possible further labour difficulties at home, and threatened complications abroad, tended so much to lessen the feeling of confidence in the immediate future that there was a marked falling off in the weight of new business coming forward. Any appreciable giving way was, however, chiefly in outside speculative brands offering here, prices for which were, in most cases, forced down quite 1s. per ton. Local and district makers, being mostly well sold, generally remained firm at their full rates, Lancashire foundry being quoted 46s. less 2½; Derbyshire 46s. net; and Lincolnshire, 43s. 6d. net, delivered Manchester; and before the close of the month, when apprehensions of further trouble either at home or abroad had been dispelled, the market generally recovered its strong position, Middlesbrough getting back to about 45s. 10d. delivered Manchester, and Eglinton 47s. 3d. net, delivered Lancashire ports. With the return of confidence heavy buying set in, and prices for local and district brands advanced about 1s. per ton, whilst in outside brands merchants were very cautious about booking at anything under makers' quoted rates. This rush of buying, which was largely of a speculative character, began to fall off before the end of February, and was followed by a lull in the market, and a gradual weakening of prices which continued over the remainder of the first half of the year. It may also be mentioned that during this period considerable quantities of Scotch pig-iron were imported into Manchester through the Ship Canal, and competed, so far as many of the surrounding districts were concerned, under very favourable conditions as compared with the ordinary deliveries by rail and at other ports, prices for both Scotch and Middlesbrough iron, delivered Manchester or Salford Docks, becoming recognised quotations in the market. A threatened competition of American pig-iron, which was to be shipped to Manchester as ballast cargo in cotton ships, also for a time became a question which was much talked of in the market. Some considerable purchases were made at prices which enabled American iron to be imported here in competition with Scotch brands, but it soon became evident that with advancing prices in the United States, and the upward movement in freights, it was not at all probable that American pig-iron could obtain a footing here as a permanent competitor, and though arrivals have been coming up the Canal during the remainder of the year, there is not much expectation of any further quantities being shipped to England after the contracts already entered into have been completed. Local brands of pig-iron did not vary to any very material extent, averaging about 45s. 6d. for foundry, less 2½ delivered Manchester, but Lincolnshire makers, who were supposed to be fully sold, unexpectedly reduced their list rates 1s. per ton, bringing foundry to about 42s. 6d. and 43s. and forge to 40s. 6d. and 41s. net delivered Manchester, with Derbyshire readily obtainable at about 45s. to 45s. 6d. net. Middlesbrough iron got down to about 45s. 4d. to 45s. 10d. delivered by rail, and 44s. delivered Docks, with Eglinton about 45s. 9d. delivered ports, and 48s. delivered Docks. With the turn of the second half of the year a strong, healthy tone came over the market, with steadily increasing buying, which has been maintained to the close. Local brands have gradually advanced until makers' prices have reached 48s. 6d. for foundry, and 47s. 6d. less 2½ for forge, delivered Manchester, whilst Lincolnshire has touched 47s. to 47s. 6d. for foundry, and 44s. 6d. for forge, with Derbyshire foundry brands 49s. to 50s. net, delivered Manchester. Outside brands also followed in a similar upward direction, quotations for good foundry Middlesbrough being advanced to 49s. 4d. delivered by rail, and 47s. 6d. delivered docks, with Eglinton 52s. 3d. to 52s. 6d., delivered Docks. Makers are so well sold for several months ahead that they are quite indifferent about booking further orders, even at their present full rates, the impression prevailing generally that prices are likely to be still higher in 1897, and there is an almost complete absence of underquoting by merchants to secure any business that may be just now coming forward.

Finished iron makers commenced the year mostly well supplied with orders, especially in bars, and the position generally has been very much strengthened by the considerable upward move in prices on the Continent, which has resulted not only in withdrawing the keen competition of foreign-made iron in this market, but has also enabled Lancashire makers to export more largely than for a considerable time past, some of the local works having been better employed than for a very long period. Bar iron has held the strongest position in the market, quotations, which were £5 10s. for Lancashire and £5 12s. 6d. to £5 15s. for North Staffordshire, qualities stiffening up about 2s. 6d. per ton during the first couple of months. The depression which subsequently came over the iron market had, however, the effect of weakening prices, until some local makers were accepting as low as £5 6s. 3d. and £5 7s. 6d., with North Staffordshire bars obtainable under £5 10s., but the general revival of activity during the second half of the year caused a rapid return of prices to their previous strong position, and before the end of July Lancashire bars had got back to £5 10s. and £5 12s. 6d., makers being firm at the latter figure for shipment, and in October local makers had put up their prices to £5 15s. with North Staffordshire bars quoted £6, whilst there was a further advance in November and December which brought prices up to £6 for Lancashire and £6 5s. for Staffordshire bars, with makers very indifferent about selling forward at these figures. Hoops have generally been in but moderate demand, and although list rates have been advanced from £6 2s. 6d. for random and £6 7s. 6d. for special-cut lengths in January to £6 10s. for random and £6 15s. for special-cut lengths, delivered Manchester district, and 2s. 6d. less for shipment, at the close of the year, this upward move has been almost entirely due to the advance in bars and the increased cost of production. Sheets have remained in a more or less weak condition, owing, on the one hand, to a largely increased output, and on the other to lessened requirements as a rssult of the troubles in South Africa, which had become an important market for this particular class of finished iron. At the beginning of the year sheets were quoted £7 10s. to £7 12s. 6d., delivered in this district, but gradually receded to about £6 15s. and £7; at the close they have slightly improved, and quotations now stand at about £7 5s. and £7 10s., delivered Manchester district.

The position in the steel trade has shown a good deal of fluctuation, but there has been a very substantial upward move, both in raw material and in some classes of manufactured goods. Notwithstanding the strong tone in pig-iron at the commencement of the year hematites were weak, and readily obtainable at 55s. 6d. to 56s. less 2½ delivered Manchester, with merchants underselling. During the second quarter there was a decided upward move, bringing prices to about 58s. and 58s. 6d., but this was only partially maintained, and prices gradually got back to the old figures. Hematites remained in a weak, unsatisfactory condition till well towards the end of the year, when a considerable weight of buying came forward, which caused a strong upward move in prices, quotations getting up to about 59s. and 60s. less 2½ for good foundry qualities, delivered in this district. Local makers of steel billets have had to contend with very keen competition on the part of American makers, and this has kept prices down at a comparatively low point. For delivery Manchester district £4 7s. 6d. to £4 10s. net has been an average figure for local billets during a considerable portion of the year, and although there has been a large weight of buying, makers have had a difficulty in raising their prices very much above these figures, and with the close of the year it is exceptional where they are getting more than £4 17s. 6d. net, delivered. In some descriptions of manufactured steel there has been a strong upward move, particularly in material for general constructive work, prices for which have gone up 10s. to 15s. per ton. Local-made bars have, however, shown no corresponding improvement, and have ranged from about £5 17s. 6d. as the minimum, to about £6, with £6 2s. 6d. got in some special cases. Boiler plates, considering the activity in the shipbuilding and boiler-making trades, have also shown comparatively little improvement. Prices at the commencement of the year were necessarily irregular, owing to the shipbuilding dispute, and Scotch plates could be bought readily at about £6 delivered in this district, or perhaps a trifle less. During the year prices have fluctuated a good deal, but there has been a gradual upward tendency, local steel plates getting up to £6 10s. and £6 15s., and Scotch about £6 10s., with makers indifferent about booking, except for prompt delivery, as they are anticipating a substantial rise in prices as soon as the work in hand at the shipyards is further advanced, early in the ensuing year.

The coal trade has not more than partially followed the improvement in other industries. The exceptional mildness of the winter threw upon the market large quantities which would otherwise have gone into consumption for house-fire purposes, and notwithstanding the increased requirements for general manufacturing purposes, steam and forge coals during the greater part of the year have been a drug upon the market, and excessively low in price. The most noticeable feature has been the collapse of the coal trade Conciliation Board and the temporary excitement in the market which followed, causing a rush of buying and for the time being an upward move in prices. Housefire coals, which during the summer got down to very low figures, have with the close of the year returned to the prices ruling last winter, with in some cases a slight advance upon these. Prices, which at the commencement of the year averaged 10s. to 10s. 6d. for best Wigan Arley; 9s. to 9s. 6d. for Pemberton four-ft. and seconds Arley, and 7s. to 7s. 6d. for common house coal, were at the close steady at about 10s. 6d. to 11s. for best Wigan Arley, 8s. 6d. to 9s. for Pemberton four-ft. and seconds Arley, and 7s. to 7s. 6d. for common house coal, which are about 9d. above the minimum summer rates. Steam and forge coals seem to have established some permanent improvement, and have advanced about 1s. per ton upon the lowest prices of the year. At one period about 5s. 6d. would have been taken for ordinary qualities at the pitmouth, but with the close of the year 6s. 6d. represents about the minimum selling price. The gas coal and locomotive fuel contracts given out during the summer were reversed at a reduction of 6d. upon last year's excessively low prices, which affords unmistakable evidence of the depressed state of the coal trade at the time the contracts were settled. Engine fuel has fluctuated according to the demand for round coal, but closes the year steady at an advance of 3d. to 6d. upon the rates ruling in January, prices with the close of the year averaging 3s. and 3s. 6d. for common, to 4s. 6d. and 5s. for best sorts, as compared with 3s. for common, to 4s. 6d. for best qualities, which were the general selling prices at the commencement of the year. The shipping trade for the greater part of the year has been in a very depressed condition, with extremely low prices ruling, colliery proprietors anxious to clear off their surplus stocks of round coal, pushing them for sale at the ports at as low as 6s. 9d. to 7s. delivered Garston or Liverpool. Towards the close of the year there has been a decided improvement, first in a largely increased weight of buying at low prices, which has more recently been followed by a steady improvement in prices until sellers are realising an advance of fully 1s. per ton on the low rates previously ruling, ordinary steam coal, delivered ports on Mersey, averaging 7s. 9d. to 8s. delivered Partington tips, Manchester Ship Canal 8s. to 8s. 3d., and Manchester Docks 7s. 6d. to 7s. 9d. per ton.

BELFAST TRADE NOTES.

(*From our own Correspondent.*)

AT this season a short review of the work done during the past year may not be out of place. Although in Belfast there are only two firms of shipbuilders and engineers of note, still the amount of work turned out by them has been remarkable. Indeed, in this connection, I can hardly do better than quote the *Glasgow Herald* on the subject, when it says:—"Most of the records of the year of any consequence belong to Belfast, for the commercial capital of Ireland has not only increased its aggregate out of all proportion to the increase in other districts, but Messrs. Harland & Wolff head the world's list with a total, both in tonnage and H.P., that may safely be taken as the highest ever reached by any one firm." This statement is borne out by the returns given below for the two Belfast yards viz.:—

	Vessels.	1896. Tonnage.	1895. Tonnage.
Harland & Wolff ...	14	81,316	58,093
Workman, Clark & Co.	12	38,340	43,723

The total I.H.P. of the engines turned out by Messrs. Harland & Wolff figures up to 61,324, while that of Messrs. Workman, Clark & Co. comes out at 19,850.

Another point of interest about the year's production is, that, while last year, all the vessels built on the Queen's Island were registered in Liverpool, this year, vessels have been built for London, Liverpool, Southampton, Belfast, and Hamburg, no less than three large steamers, including the huge twin-screw *Pennsylvania*, of 13,700 tons, being for German owners. The engines of the *Hannibal* and a caisson for Portsmouth Dockyard were also completed for the British Government. Both firms were seriously hampered by the fire last July, but the larger part of the destroyed buildings have been already replaced and partly occupied. The only other firm doing marine engines here, viz., Messrs. Maccoll & Co., Limited, have in hands a fair-sized tug for the Belfast Harbour Commissioner, and have done, during the year, a large amount of repair work.

Turning from our retrospection of the past year to the prospects for the new year, we find that these are eminently satisfactory. Both the large firms have in hand sufficient work to keep them at high pressure during the ensuing year, and granted a respite from serious labour troubles, business should be very brisk. In this connection it should be mentioned that the trouble with the A.S.E. has been got over, the men having accepted the offer of 1s. advance per week. This arrangement remains in force for six months. Relations with the other unions are satisfactory at present.

During the past month, a large steel screw steamer for the Nippon Yusen Kaisha, of Japan, was launched from the North yard of Messrs. Workman, Clark & Co., Limited. The principal dimensions of this handsomely modelled vessel are:—Length, 445 ft.; breadth, 49 ft. 5 in., depth, moulded, 38 ft. 6 in., with a gross tonnage of about 5,900 tons. She has been built to Lloyd's highest class and with Board of Trade passenger certificate. The vessel has been specially designed to suit the passenger and cargo trade of the company, and all the most recent improvements in every department have been introduced. She has been divided up into nine watertight compartments, and has a cellular double bottom right fore and aft for water ballast. Hold beams have been dispensed with, leaving the holds clear for storage of cargo. At each hold two powerful winches and derricks are placed, each of these being capable of lifting 6 tons, and for lifts up to 30 tons a large derrick and special winches can be utilised. The derricks are suspended from the masts, of which there are four when available; and when necessary from crane posts. The safety of the cargo has been well assured, every compartment being fitted with fire-extinguishing pipes, and the ventilation is most complete, the Baird-Thomson mechanical system being introduced throughout. The steerage accommodation, which is situated in the after 'tween decks, is arranged for 180 persons. Splendid accommodation is also provided for the captain, officers, engineers, and crew. All the living rooms in the vessel are heated by a service of steam piping. The steering gear has been supplied by Messrs. Caldwell & Co. and is controlled from the flying bridge. An installation of electric lighting will be fitted throughout by Messrs. W. C. Martin & Co., Glasgow, including Suez Canal search-light, side lights, and powerful cargo lamps at all hatchways for night work. The steamer will be propelled by twin sets of engines, with cylinders, 20 in., 33½ in., and 56 in., stroke 48 in., with steam supplied from four steel boilers at a pressure of 200 lbs. On leaving the ways, the vessel was named the *Kamakura Maru*, and in accordance with a Japanese custom, a large flock of pigeons were liberated from their temporary home on the bow of the vessel when she first touched the water. The work has been carried out under the supervision of Captain T. H. Periam and Mr. Macfarlane.

Messrs. Workman, Clark & Co. also launched a steel-screw steamer named the *Belvidere* of 1,650 tons gross, for Glasgow owners. She is intended for the fruit trade, and will be fitted with engines of 2,500 I.H.P.

The same firm also launched another steamer named the *Hidalgo*, for Vera Cruz. The tonnage of this vessel is 1,176 tons gross.

Messrs. Harland & Wolff have now commenced the lengthening of the s.s. *Augusta Victoria*. Two of her funnels have been removed and several of her boilers taken out preparatory to placing the vessel in the dry dock. The operation will be on a somewhat larger scale than that performed on the *Scot*, as the vessel will be increased in length by over 80 ft.

Perhaps it may be well to mention here that Messrs. The

Queenstown & Passage Dry Dock Co., Passage West, co. Cork, have built a large bathing vessel of wood for delivery next year, which is intended for the use of the boys to be trained in H.M.S. *Black Prince*, which vessel they are now fitting out as a training ship to be stationed at Queenstown. Irish boys will now have an opportunity and every encouragement for entering the Navy.

They have two steel barges under construction, and have had an unusually large amount of repair work during the year.

NORTH-WEST OF ENGLAND.

(*From our own Correspondent.*)

Barrow-in-Furness.—Undoubtedly the chief item of news of the month in the local shipbuilding world is the announcement of the purchase of the undertaking of the Naval Construction and Armaments Co. at Barrow, and of the property and freehold of the Barrow Shipbuilding Co. by "a responsible firm." For special trade reasons the name of this firm has been kept an official secret, but rumour was rife from the very first intimation of the sale of the concern that the purchasers were Messrs. Vickers, Son & Co., of River Don Works, Sheffield, and this has been proved to be the fact, for although this firm still observes reticence on the matter, and declines to say yes or no to the question as to whether they have bought the Barrow works, it has become necessary on the part of the management of the Naval Construction and Armaments Co. to acquaint their numerous clients with whom they are now negotiating new business that the great Sheffield firm are actually the purchasers, and that they will carry out all contracts undertaken by the Naval Construction and Armaments Co. It is thought probable that the name of the Barrow firm will not be altered, except, perhaps, by the adoption of the word "Vickers" before it, and it is certain in the new arrangements the firm which up to now has but justified the first part of its double-barrelled name will, under its new ownership, justify the second part, because it is the intention of Messrs. Vickers not only to build and engine ships of war at Barrow, but to utilise their own armour plates and their own make of guns in order to fully equip and complete these engines of war for immediate action. When his Excellency Li Hung Chang was in Barrow a few months ago, he put, amongst other very pointed questions to the Duke of Devonshire, whether at Barrow they could undertake the order to build, engine and equip with armaments any orders for vessels entrusted to them. The Duke replied that they could only build the ships and fit them up with engines, the armour and ordnance having to be obtained from elsewhere. At Newcastle Li was shown through Sir William Armstrong's works, where guns are manufactured, and the advantage possessed over the Barrow works in this respect was noted. The acquisition of the Barrow Works by Messrs. Vickers, however, puts an end to this disparity, for under the new arrangement ships can be built and engined at Barrow by Messrs. Vickers, who will use their own make of armour plates and their own make of guns. It is understood that Messrs. Vickers are about to bring out a new gun as a rival to the Armstrong gun. Under new conditions the Barrow firm will have a twofold advantage over the Elswick firm, inasmuch as the latter neither make their own engines nor their own armour-plates, and the further advantage will help the Barrow Co. that the ordinary plates used for ship construction and boiler-making are produced at Barrow alongside the shipyard. Those who have noted the prosperity of the Elswick works and the activity that has obtained there during periods when other works have suffered from depression of trade and scarcity of orders for new tonnage, will be able to form some opinion of the importance to Barrow of the change in proprietorship of its big shipyard, as it is the intention of the new owners to build modern types of warships, and fit them up for immediate service, and dispose of them to any needy purchaser or otherwise. Of course, this will not in any sense prevent the Barrow firm from competing for all and every class of commercial tonnage on offer, and it is quite on the cards that much more commercial work will be done under the new auspices than under the old or present *regime*. The intimation is made that Mr. A. Adamson, managing director of the Naval Construction and Armaments Co., and his official staff, will be retained in the service of the new owners, so that no break in the continuity of business will occur. The intention at present is not to put up armour-plate works at Barrow, or even to put down a gun manufactory, as Messrs. Vickers, Son & Co.'s plant at Sheffield is capable of producing all that will be required; but, prospectively, the chances are that branch works for this business will be erected at Barrow, because the very material required in the building up of plates and in the manufacture of guns are on the spot at Barrow, together with the big shipbuilding yard at which they will be utilised. Barrow is the capital of a district rich with unbounded supplies of the best hematite ores in the world; it possesses deep-water docks of large area, in which the largest class of warship or the largest liners ever launched can ride with safety; and the launching area at the shipyard, with its mile and a half of width in a deep-water channel, is the best in the world. Coupled with these advantages is the further fact that Barrow has already made for itself a splendid reputation for the good work it has done for the Admiralty, and notably in the unqualified success that has attended the trials of H.M.S. *Powerful*, first-class cruiser. The probability is that in the early future big line-of-battleships will be built at Barrow for foreign navies, as well as for the English Government, and it is reasonable to suppose that Messrs. Vickers, Son & Co., with the many advantages they possess within themselves, will be able to compete on favourable terms with any firm engaged in the same line of business. It is evident the new purchase will give an impetus alike to the trade of Barrow and to the trade of Sheffield. Although it is not proposed to make either armour plates or guns at Barrow at present, increased work will be done at the latter place in the building of gun carriages, and engineering fittings generally required by ordnance. In the purchase of the Barrow Shipbuilding Co.'s property and freehold, the interest possessed in the Barrow yard by the Duke of Devonshire and the Cavendish family generally has been acquired by Messrs. Vickers, Son & Co., who are now the absolute owners of the concern. They are paying the shareholders of the Naval Construction and Armaments Co. out in full at par value, representing £5 per share, the capital being £300,000, and they are also paying 5 per cent. interest on the current financial year ending June 30th, 1897. Of course, the purchase is subject to the approval and sanction of the shareholders of the Naval Construction and Armaments Co., but there can be no doubt that sanction will be given, because the value of the shares before the provisional sale was £3 5s. only, and because, further, the chief spirits in the transaction have an overwhelming influence in the number of shares that they hold. A meeting of the shareholders of the Naval Construction and Armaments Co. will shortly be held to decide upon the question, but before that can be done the lawyers have to fix up the legal features of the transfer, and this, in view of the importance of the question, will take a little time. In the meantime work is going on as usual at the Barrow yard, and hopes are entertained that the change of ownership will mean good things for the town, not only by means of the development of the shipyard, but in the creation of smaller industries in the town, which can feed the shipyard with material, and help to make Barrow even more the home of shipbuilding than it has been in the past. It is generally believed before long that other shipbuilding firms will locate themselves in Barrow because of the many advantages it possesses, and the decision of Messrs. Vickers, Son & Co. to come to Barrow will certainly help to create fuller confidence in the place, and thus increase the commercial status of the town. The tendency in the steel trade is to move towards the sea-board. Messrs. Cammell, of Sheffield, voiced that view when they removed their Dronfield works to Workington. Now Messrs. Vickers, another big Sheffield firm, are following their example; but while in the case at Workington only steel rails are produced, at Barrow the steel rail trade, itself a big and important department, is already supplemented by plate mills and other branches in connection with the shipbuilding trade. This department will now be still further developed, which in itself will be a good thing, because experience has shown that those firms which have the biggest output of shipbuilding material are most successful, because of the economic means of working which a number of mills engaged on various thicknesses and classes of material afford.

During the month no new orders for ships have been booked at Barrow. The enquiry is fairly steady, and new orders are expected either before the end of the year or early next year. The Naval Construction and Armaments Co. were not successful in securing an order for one of the three second-class cruisers just given out by the Admiralty. This was all a question of price, the Barrow company being about £15,000 above the successful tenderers. The two vessels of a similar class just delivered to the Admiralty, the *Juno* and the *Doris*, have proved themselves highly successful in their steam trials, and have given every satisfaction. An accident happened to the last-named cruiser which is of a somewhat remarkable character. She was steaming astern at 14-knot speed, when for experimental purposes those in charge of the trials determined to change from steam gear to hand gear. A brake was applied to the rudder during the change, but it was naturally not sufficient to hold it, with the result that it flew back and struck one side of the stern frame, doing much damage. Probably no ship in the world could go through such a test unscathed. Fortunately the rudder part is not damaged, but the Admiralty, who have undertaken the repairs, will not have the cruiser ready for trials for another month. The greatest credit is due to Barrow in regard to the highly successful result of the trials of the first-class cruiser *Powerful*. This ship was ready for delivery before her sister ship, the *Terrible*, but the latter was the first to get the navigating party, and the *Powerful* had to wait at Portsmouth until the *Terrible* had had her trials, which, to begin with, proved unsuccessful. Then the *Powerful* passed through her first trials without a hitch, and on her final full-speed trials, owing to unscientific stoking, they had to be abandoned because of the combustion in the up-take heating the upper parts of the boiler and funnels. This resulted in several alterations, alike in the *Powerful* and the *Terrible*, including the lengthening of the funnels 10 ft. The *Terrible* then had another attempt, and again failed. The *Powerful* afterwards went out on her final trials, and passed through them with high credit and without the slightest hitch. The *Terrible* will probably not proceed again on trial till sometime in January. As there has been much competition and rivalry between the Barrow and the Clyde-built cruisers, these trials have been watched with considerable interest. Naturally Barrow is proud of the success of her production, but there is a genuine feeling of regret here in shipbuilding circles at the trouble Messrs. Thompson are having with the *Terrible*. The other Admiralty work on hand at Barrow is proceeding very satisfactorily, and there is room in the Barrow yard to put down several keels if any other orders can be secured.

The following is a list of the vessels launched in 1896 by the Naval Construction and Armaments Co., Limited:—

Name.	Tonnage.	I.H.P.	Remarks.
H.M.S. Doris	5,600	9,600	2nd class cruiser.
S.S. Clan Menzies	2,667	2,300	
S.S. Clan Lindsay	2,668	2,300	
S.S. Clan Sutherland	2,819	2,300	
H.M.S. Avon	300	6,000	Torpedo boat destroyers.
H.M.S. Bittern	300	6,000	
H.M.S. Otter	300	6,000	
Total	14,654	34,500	

Last year the tonnage was 25,644, and the I.H.P. 64,450. It should be explained, however, that if the *Niobe* had been launched in December, and she is ready for launching, the tonnage this year would have beaten that of last year. As it is, the *Niobe* will not be launched until February next, as it suits the arrangements of the Barrow works, and facilitates economy of production to launch their ships as heavy as possible, and nearly completed from a shipbuilder's point of view, before the vessels are taken to the other side of the yard, through the docks, to receive their engines and final fittings. In January the Barrow and Belfast twin-screw Channel steamer *Duke of Devonshire* will be launched, and early in March the two Great Western Railway Co.'s steamers *Roebuck* and *Reindeer* will be launched. At present much attention is being devoted in the engineering department to fitting up the *Bittern* and *Avon* torpedo-boat destroyers, while the engines and boilers are also being got ready for the other ships of this class, the *Otter* and the *Leopard*, which are ready for launching. Much activity exists in the building up of Thornycroft water-tube boilers for these craft, and in making the Belleville boilers for the *Niobe* and the *Amphitrite*, first-class cruisers. The success of the *Powerful's* Belleville boilers is regarded as conclusive, even by the friends of the old cylindrical class of boiler, and it is noticeable that the Admiralty is going in for a fuller use of these quick and reliable steam generators in all the ships they are building. The consequence of this change in boilers is having two effects. There is a big demand for tubes and but a small supply, as only a few firms can now make a reliable article, and in the second place as much of the work of boiler construction is now done by engineers, it is an undoubted blow to the old boiler-making trade. The probability is that a steel tube manufactory will be started at Barrow, as one of the features which the change of ownership of the Barrow shipyard will bring about.

West Cumberland.—The shipbuilding industry in West Cumberland is well maintained, and at Workington and Maryport there is a very steady condition of things, orders being fairly numerous and the work in hand all that is required to maintain the activity of trade.

Shipbuilding Material.—There is a good demand for all classes of shipbuilding material. A few weeks ago there was a noticeable weakness in the trade as regards new orders, but shipbuilders had ordered largely forward, and makers were well sold. Since then the accession of new ship-building orders has introduced new activity into the market, and makers are again able to secure fuller orders of some importance. Steel plates are at £5 5s. and boilers at £6 5s. per ton.

The Hematite Trade.—There is marked steadiness in the hematite pig-iron trade, and makers could do more business if they could produce more iron; but that is at present impossible, owing to the scarcity of iron ore. Prices remain steady at 51s. to 52s. per ton for mixed Bessemer Nosnet f.o.b. Stocks now represent 296,041 tons, or an increase of 6,866 tons since the beginning of the year.

Shipping.—A better tone is apparent in the shipping trade. The total shipments this year have reached 311,112 tons of pig-iron, and 461,981 tons of steel, as compared with 282,100 tons of pig-iron and 355,686 tons of steel in the corresponding period of last year, an increase of 29,012 tons of pig-iron and 106,295 tons of steel.

The Junior Photographer. Vol. 3, No. 29. London: Percy Lund & Co, 1896.

THE mid-December issue of this publication is worthy of the reputation which it and its publishers' other ventures have already achieved. There is an interesting article, amongst others, on the platinotype printing process, showing the junior how to use and how far he may press this most effective method of showing off his work. Another useful article is devoted to the subject of lantern entertainments. The writer wishes to show how both the lantern manipulator and the lecturer must do their best and not rely too much on one another, though all the time working together for the good of the general effect. The illustrations reach the usual high standard, those illustrating the poem at the end of the magazine and the study of a boy reading being especially good.

Traverse Tables. By Major-General J. T. Boileau, F.R.S. London: W. H. Allen & Co., Limited. Seventh edition. 1896.

THE orignal edition of this work was prepared for the use of the officers of the Revenue Department in India. The object being to allow them to fix the latitude and longitude of given places by reference to these tables, instead of by using logarithms. In the present work the latitudes and departures have both been computed to seven places of decimals, though only five places are shown in the tables. An appendix is added with some tables useful to surveyors. These comprise tables for converting chains and links into yards and *vice versa*, tables for converting chains and links into feet, a table showing the length of a degree minute and second of latitude and longitude for every degree of the quadrant, and some others. The tables have taken a vast amount of work in calculation, but they have been thoroughly checked and may now be considered to be as nearly absolutely accurate as anything can be. They will be found of great use to the navigator as well as to the surveyor, for they enable positions to be ascertained with less trouble and with greater accuracy than the logarithmatic tables. The work is accompanied by a full and clear introduction and explanation.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Jupiter.—On November 6th the *Jupiter*, an iron steam tug of about 150 tons, was launched at South Shields, owned by Mr. G. E. Bromage, London.

Japonica.—On November 7th the *Japonica*, a steel steam ketch of about 145 tons, was launched at North Shields for Mr. C. Morley, Milford.

Lucern.—On November 7th the *Lucern*, a steel steam ketch of about 145 tons, was launched at North Shields for Messrs. Maw & Son, Hull.

Tynemouth.—On November 21st a sailing ketch of about 143 tons gross, named the *Tynemouth*, was launched at Newcastle for Messrs. Hagerup, Doughty & Co., Grimsby.

Sir Charles Beresford.—On November 23rd an iron steam ketch of about 150 tons gross, named the *Sir Charles Beresford*, was launched at Hull for Mr. J. McCann, Hull.

Tamsui.—On December 1st the new steamer *Tamsui* was launched by Messrs. Joseph L. Thompson & Sons, Limited, of the North Sands Shipbuilding Yard, Sunderland, and has been built to the order of the Osaka Shosen Kabushiki Kaisha, of Japan. She is the second vessel built to the order of this firm by Messrs. Thompson. She is 262 ft. long by 35 ft. beam, and 23 ft. depth, moulded, and is built on the spar-deck rules to Lloyd's 100 A1 class, under their special survey. The vessel has spacious accommodation in the poop for 24 second-class passengers, and has a separate pantry and sanitary arrangement attached. The bridge amidships is fitted for the accommodation of first-class passengers at the forward end, with a large saloon in the centre; accommodation is also fitted here for the purser, steward, pantry, bath-room, &c. At the after end of the bridge mess-room accommodation is fitted for the officers, engineers, scullery, bath-room, &c. On the top of the bridge at the forward end is fitted a large house and captain's room. The forecastle is fitted up for the accommodation of the seamen, firemen, petty officers, &c., and special erections are also built for lamp-rooms, stores, &c. The main deck is laid throughout, and the forward 'tween decks are fitted for the accommodation of steerage passengers. On the forecastle head is placed a direct steam windlass for working the stockless anchors. Steam steering gear is fitted at the after end of the bridge with the controlling gear from the captain's bridge. Powerful screw gear is fitted on the poop aft. Four powerful steam winches are fitted for the handling of cargo. The vessel is smartly rigged in fore-and-aft schooner style. Four large lifeboats are fitted amidships, and two smaller boats on the poop aft. Water ballast is arranged in the cellular double bottom, right fore and aft, and in the fore-and-aft peaks. The engines and boilers are constructed by Messrs. John Dickinson & Sons, Limited, of the Palmer's Hill Engine Works, Sunderland, the cylinders being 21½ in., 36 in., and 49 in. by 39-in. stroke, supplied with steam from two multitubular boilers, constructed to work at 180 lbs. pressure. The vessel is built to meet the Board of Trade regulations for a passenger certificate, and is throughout constructed to meet the requirements of the trade for which she is intended. The launch was most successful in every way, the christening ceremony being performed by Miss Dickinson, daughter of Mr. John Dickinson, J.P., who also launched the vessel by means of hydraulic power.

Gloxinia.—On Thursday, December 3rd, there was launched from the yard of the Tyne Iron Shipbuilding Co., Limited, of Willington-Quay-on-Tyne, a steel screw steamer, built to the order of Messrs. The Stag Line, Limited (Messrs. Joseph Robinson & Sons, of North Shields, managers), and of the following dimensions, viz.:—Length, 313 ft.; breadth, 45 ft.; depth, 23 ft. 1 in., moulded; and to class 100 A1 at Lloyd's on the single-decked rule. This vessel has water ballast fitted right fore and aft on the cellular system, and is also fitted with all modern improvements for the rapid loading and discharging of cargo, including four double-cylindered steam winches, direct-acting steam windlass, large donkey boiler, steam-steering gear by Messrs. Davis & Co., of London, and Hasties' screw gear aft. The engines, which are to be supplied by Messrs. The North-Eastern Marine Engineering Co., Limited, are of the triple-expansion type, having cylinders 23 in., 38 in., and 61 in. by 39 in. stroke, and working at a pressure of 180 lbs. On leaving the ways the vessel was christened the *Gloxinia* by Miss Nellie Robinson, daughter of Mr. Joseph Robinson, of Ingleside, North Shields.

Socotra.—On December 3rd there was launched from the Jarrow yard of Palmer's Shipbuilding and Iron Co., Limited, a finely-modelled twin-screw cargo steamer, built to the order of the P. & O. Steam Navigation Co., Limited, London. She will be rigged as a two-masted fore-and-aft schooner, and has been constructed under special survey to class 100 A1 at Lloyd's, and is of the three-deck type with poop, bridge, and forecastle. Her dimensions are as follows:—Length between perpendiculars, 450 ft.; beam, 52 ft.; moulded depth, 33 ft. 6 in. Her carrying capacity is 8,500 tons, and she is fitted with twin-screw triple-expansion engines, also built by the Palmer's Co. As the vessel left the ways she was named *Socotra* by Mrs. A. M. Palmer, wife of one of the directors of the Palmer's Co.

Erandio.—On December 4th Messrs. Ropner & Son launched at Stockton-on-Tees the steel screw steamer *Erandio* of the following dimensions, viz.:—Length b.p., 320 ft.; breadth, extreme, 46 ft.; depth moulded, 23 ft. 9 in. The vessel has been designed to carry a deadweight cargo of 4,500 tons on Lloyd's summer freeboard. She will be fitted with triple-expansion engines by Messrs. Blair & Co., Limited, of about 1,000 effective H.P. The steamer has been built to the order of a Newcastle firm.

Eden.—On December 4th Messrs. R. Williamson & Son, Workington, launched the s.s. *Eden*, of the following dimensions: Length, 130 ft.; breadth, 22 ft.; depth, moulded, 10 ft. 9 in. The vessel has a long raised quarterdeck over engines and boiler, one large and one small hatchway, steam winch, two masts, steam steering gear in wheel-house, and steam capstan aft; carrying capacity, 270 tons. She is fitted with compound surface-condensing engines having cylinders 17 in. and 34 in. by 24 in. stroke, large steel boiler with 120 lbs. working pressure, constructed by Messrs. Ross & Duncan, Govan, Glasgow.

Sea-going Lighters.—On December 4th Messrs. R. Craggs & Sons launched at Middlesbrough two steel sea-going lighters of the following dimensions:—125 ft. b.p. by 20 ft. 9 in. by 10 ft. 8 in. moulded. The vessels have been built to Lloyd's highest class to the order of Mr. J. Constant, of London.

Amazonas.—On December 4th the cruiser *Amazonas*, built to the order of the Brazilian Government, was launched from the yard of Sir W. G. Armstrong & Co., at Elswick. She is built entirely of steel, and is sheathed with wood and coppered. Her principal dimensions are as follows:—Length, 330 ft.; breadth, 43 ft. 9 in.; draught, 16 ft. 10 in.; displacement about 3,450 tons. The vessel will be fitted with twin-screw machinery of 7,500 I.H.P., and it is anticipated that she will attain a speed of 20¼ knots with natural draught.

Bambro' Castle.—On December 5th there was launched from the yard of the Co-operative Shipbuilding Society, Blyth, a wood steam fishing vessel, built to the order of Mr. R. Irvin, junior, of North Shields. She will be fitted with compound surface-condensing engines by Messrs. Baird & Barnsley, of North Shields. The vessel was christened the *Bambro' Castle*.

Dalegarth.—On Saturday, December 5th, Messrs. Wm. Gray & Co., Limited, launched a fine steel screw steamer of the following dimensions, viz.:—Length overall, 258 ft.; breadth, 36 ft. 8 in.; depth, 19 ft. 9 in. She has been built to the order of Messrs. R. and J. H. Rea, of Liverpool, chiefly for the coasting trade. She will take Lloyd's highest class, and is of the raised quarterdeck type, with bridge and topgallant forecastle. The accommodation for captain, officers and engineers will be fitted up in the bridge, and for the crew forward. The hatchways are of the self-trimming type, and the sides of the vessel are built with deep frames and stringers of special design to facilitate the discharging of coal, and wing boards are fitted to prevent the coal cargo shifting, so that all hand-trimming is reduced to a minimum. A cellular double bottom is fitted and large ballast tanks in the after and fore peaks, steam winches, patent donkey boiler, steam-steering gear placed in engine-room casing, hand screw steering gear aft, direct steam quick-warping windlass, schooner rig, boats on beams overhead, and all improved appliances for working the steamer will be provided. The engines are of the triple-expansion three-crank type, and are from the Central Marine Engine Works of Messrs. Wm. Gray & Co., Limited; they are of extra large power for a vessel of this description, the cylinders being 21 in., 34 in., and

58 in. diameter, with 39 in. piston stroke, and two large steel boilers to work at a pressure of 180 lbs. per square inch, and the vessel is intended to have a speed of 11 knots to catch the tides in her trade. The steamer has been built to the plan, and specification, and under the superintendence of Mr. J. B. Edmiston, of Liverpool, and his local assistant, Mr. J. C. Clarke, on behalf of the owners, and the ceremony of naming her *Dalegarth* was gracefully performed by Mrs. Walter Rea, Birkenhead.

Themis.—On December 4th there was launched from the yard of Messrs. Osbourne, Graham, & Co., Sunderland, a steel screw steamer, built to the order of Mr W. Wilhelmsen, of Tonsberg, of the following dimensions:—270 ft. by 39 ft. 6 in., by 17 ft. 6 in. moulded. She is built to the highest class at Lloyd's on the deep-frame principle. The engines will be supplied by Messrs. George Clark, Limited. The vessel was named *Themis*.

Barbara.—On Saturday, December 5th, Furness, Withy & Co., Limited, launched from their Middleton Shipyard, Hartlepool, a large steel screw steamer, built to the order of Messrs. J.E. Guthe & Co., West Hartlepool. She is a fine type of a modern cargo boat, measuring over 350 ft. in length and built throughout of Siemens-Martin steel, with a large measurement, and a deadweight capacity of about 6,300 tons, built to the highest class at Lloyd's. The vessel is of the single-deck type with poop, bridge and forecastle. The holds are fitted with iron grained divisions, and all deck erections, skylights, bulwarks, &c., are constructed of steel and iron. Cellular double-bottom fitted fore and aft for water ballast, the after peak being also available as a tank. The greater portion of the plates are in 24 ft. lengths making the structure of the ship very strong. Five large steam winches, donkey boiler, patent steam steering gear amidships, screw gear aft, direct steam patent windlass, stockless anchors hauling into hawse pipes, and other modern appliances are fitted for the handy working of the ship. The saloon and cabin, providing accommodation for the captain, &c., is handsomely finished in polished hardwood. The vessel will be rigged as a two masted fore-and-aft schooner, and will be fitted with triple-expansion engines of massive design with every provision for economical working by Messrs. Wm. Allan & Co., Limited, Sunderland. On leaving the ways she was gracefully christened *Barbara* by Miss Barbara Guthe, daughter of the owner.

Anping.—On December 5th Messrs. Wigham, Richardson, & Co. launched a finely modelled steel screw passenger steamer which they are building to the order of the Osaka Shosen Kabushiki Kaisha of Osaka, Japan. The steamer is 261 ft. in length by 35 ft. in breadth by 23 ft. deep, will be rigged as a two-masted fore-and-aft schooner, and is being built to take the highest class in Lloyd's Register. Accommodation will be arranged for first and second-class passengers in a bridge amidships and in a poop, the fittings being specially calculated to add to the comfort of the passengers in the trade in which the vessel will be employed. In addition to these passengers the steamer will be fitted to carry a large number of steerage passengers. The propelling machinery is also being constructed by Messrs. Wigham Richardson & Co., and will consist of a set of triple-expansion engines, which are designed to drive the vessel at a good speed. The appliances for working both ship and cargo are of the most modern and improved kind, and include a powerful steam windlass, four steam winches, steam steering gear, large donkey boiler, &c. As the vessel left the ways she was named the *Anping*, the christening ceremony being gracefully performed by Miss Watts, daughter of Mr. Philip Watts, director of Elswick Shipyard. Amongst those present at the launch was Mr. Konishim, the superintending engineer for the owners, under whose superintendence the vessel is being built.

Kingfisher.—On Saturday, December 5th, Sir Raylton Dixon & Co. launched from the Cleveland Dockyards, Middlesbro', a steam trawler of the following dimensions:—Length, 100 ft. 8 in.; beam, 20 ft. 5 in.; depth, moulded, 11 ft. 8 in. The vessel has been built to Lloyd's highest class to the order of Messrs. C. M'Kellock & Co., of Liverpool, for the Mersey Trawlers, Limited, and is of the well-known type of steam fishing vessels, of which a large number have been built by Sir Raylton Dixon & Co. Triple-expansion engines will be fitted by the North-Eastern Marine Engineering Co., Limited, of Sunderland, the cylinders being 11 in., 17 in., 30 in., by 21 in. stroke, with a large steel boiler working at 180 lbs. pressure. As the vessel was leaving the ways she was named *Kingfisher*.

Jacob Bright.—On Saturday, December 19th, Messrs. Irvine & Co., West Hartlepool, launched a fine steel screw steamer, of about 4,150 tons deadweight carrying capacity, built to the order of W. Leatham Bright, Esq., and J. Gatton Bright, Esq., London. The vessel will take Lloyd's highest class and has been built under special survey. Her dimensions are—314 ft. by 44 ft. by 23 ft. 3 in. The deck erections consist of poop, bridge and topgallant forecastle. The saloon and cabins for captain and officers are fitted up in the poop. The engineers are berthed under bridge deck at sides of engine-room, and the crew in topgallant forecastle. The hull is built on the web-frame principle with double-bottom for water ballast fore and aft. Large hatchways are fitted; four steam winches by Irvine & Co., steam steering gear amidships, screw gear aft, two large donkey boilers and direct steam windlass. The boats are placed on beams overhead, and all modern appliances will be fitted for general trading. Engines of the triple-expansion type are being supplied by Central Engine Works of Messrs. W. Gray & Co., Limited. The hull and machinery have been built under the supervision of Mr. Sage, London. The christening ceremony was gracefully performed by Miss Irvine, who named the vessel *Jacob Bright*. This is the last vessel Messrs. Irvine & Co. will launch until after the completion of the extensive alterations to their yard, which will enable them to build up to 10,000 tons.

Gallia.—On Saturday, December 19th, Messrs. William Gray & Co., Limited, launched a fine steel screw steamer of the following dimensions, viz.:—Length, over all, 290 ft.; breadth, 40 ft.; depth, 20 ft. 6 in. She has been built to the order of Messrs. Hecksher & Son, of Copenhagen, and will take Lloyd's highest class. The deck erections consist of short raised quarter-deck, bridge and topgallant forecastle. A handsome saloon, state-room, captain's room, &c., will be fitted up in a large deckhouse on the bridge. The officers and engineers will also be accommodated in houses on top of bridge, and the crew forward. The sides of the vessel are built with deep frames, a cellular double-bottom is fitted, and a large ballast tank in the after peak. Five steam winches, patent donkey boiler, steam steering gear placed in engine-room casing, hand screw steering gear aft, direct steam windlass, schooner rig, boats on beams overhead, iron grain divisions, and all improved appliances for working the steamer will be provided. The engines are of the triple-expansion type, working on three cranks, and are from the Central Marine Engine Works of Messrs. William Gray & Co., Limited, the cylinders being 20 in., 31½ in., and 53 in. diameter, with 36 in. piston stroke, and two large steel boilers to work at a pressure of 160 lbs. per square inch. The steamer has been superintended during construction by Mr. E. Hansen, of Copenhagen, also by Captain N. Nielsen and Mr. A. Iveson on behalf of the owners; and the ceremony of naming her *Gallia*, was gracefully performed by Mrs. A. Iveson, of Copenhagen.

Steel Lighter.—On Saturday, December 19th, Mr. Joseph Scarr launched, at Beverley, a steel lighter for Joseph Rank, Esq., of Hull. She is intended for the grain trade and will carry about 1,050 qrs. of grain. Her dimensions are as follows:—Length, 70 ft.; beam, moulded, 20 ft. 6 in.; depth, moulded, 9 ft. 3 in. She is the second lighter Mr. Scarr has built for Mr. Rank, and, in addition, there are two other lighters on the stocks for the same gentleman, besides several further orders for other firms.

Conqueror.—There has lately been launched by Messrs. Cox & Co., at Falmouth, the sea-going tug *Conqueror*, built to the order of the Swansea Towage Co, and is of the following dimensions:—Length over all, 101 ft.; breadth, 18 ft. 6 in.; depth, 11 ft. She is classed 100 A for tug purposes at Lloyd's. Her machinery is of the compound surface-condensing type, the cylinders being 20 in. and 38 in., stroke 24 in., working pressure 100 lbs.

LAUNCHES—SCOTCH.

Primula.—On November 5th the *Primula*, a steel steamer of about 1,527 tons, was launched at Renfrew for the Forenede Dmp.-Selskab Det., Copenhagen.

Owenabuee.—On November 25th Messrs. Fleming & Ferguson, Limited, launched at Paisley the *Owenabuee*, being the first of two 1,200 ton twin-screw hopper steamers which they are constructing to the order of the Cork Harbour Commissioners.

Taishun.—On November 26th Messrs. Charles Connell & Co. launched from their Scotstoun shipbuilding yard, Whiteinch on the Clyde, the steel screw steamer *Taishun*, a sister vessel to the *Anping*, launched by the same firm a fortnight ago, to the order of Messrs. G. & J. Weir, Limited, Cathcart, for the China Merchants' Steam Navigation Co., Shanghai. She is being engined by Messrs. David Rowan & Son, Glasgow, and was christened by Miss Ferrier, of Shanghai, daughter of the superintendent engineer.

Ipixuna.—On December 1st Messrs. Murdoch & Murray, shipbuilders, Port-Glasgow, launched the steel screw steamer *Ipixuna*, of 270 tons gross register, and is the fourth built this year by Messrs. Murdoch & Murray for passenger and cargo service on the river Amazon. Compound surface condensing engines will be supplied by Messrs. Lees, Anderson & Co., Glasgow.

Ipswich and Jersey.—On December 2nd Messrs. Mackie & Thomson launched the steam fleeters *Ipswich* and *Jersey*, built for Messrs. Hagerup, Doughty & Co., Grimsby. The vessels are a further instalment of the order for 36 vessels, of 164 tons each, which Messrs. Mackie & Thomson are building for the same owners, and are the ninth and tenth respectively.

Glenlee.—On December 3rd Messrs. A. Rodger & Co., shipbuilders, Port-Glasgow, launched the three-masted steel barque *Glenlee*, built to the order of the Glen Shipping Co., Glasgow. This vessel registers 1,490 tons, and is capable of carrying 2,800 tons deadweight. The dimensions are:—Length, 244 ft.; breadth, 37 ft. 6 in.; depth, 22 ft. 6 in. The *Glenlee* will fit out at Port-Glasgow, and afterwards proceed to Liverpool to load for Portland (Oregon).

Garmoyle.—There was launched on Thursday, December 3rd, from the yard of the Caledon Shipbuilding and Engineering Co., Limited, Dundee, a handsomely modelled steel screw steamer, built to the order of the Clyde Shipping Co., Limited, of Glasgow, for their passenger and cargo service. Her principal dimensions are:—Length, 260 ft.; breadth, 33 ft. 6 in.; depth of hold, 16 ft. 4 in., having a gross register of about 1,200 tons. The vessel is built in excess of the highest class in the British Corporation Registry, and is intended for the company's London and Glasgow trade. The deck machinery consists of four powerful steam cranes and two steam winches for working cargo, also steam steering gear, all by Messrs. Caldwell & Co., Limited, of Glasgow, and steam windlass by Messrs. Emerson, Walker, and Thompson Bros., Gateshead, and the other equipments are all of the latest type. Accommodation is provided for about 90 first-class passengers, aft and amidships. The main entrance to the saloon is from a large deck-house on poop, containing four state-rooms, and saloon staircase. The saloon entrance is finished in polished teak wood, the ceiling is of Tynecastle tapestry and the floor laid in mosaic. A large open space in the centre of the floor gives light and air to the dining saloon, and is covered by stained glass of chaste design. At the foot of the staircase, a lobby leads to the dining saloon at the after end, and the steward's pantry, &c., at the fore end. Including the ladies' cabin there are first state-rooms aft, all handsomely furnished, and the after-end of the saloon is arranged to accommodate passengers, being divided from the fore part at night by curtains. The cabin walls are panelled in sycamore and mahogany, with satin wood mouldings, a dado forming the lower part of the design. The floors of the dining-saloon, state-rooms, ladies' room, and lavatories, are all laid in mosaic; the whole presenting a very elegant appearance. Electric bells are fitted throughout the cabins and saloon. Amidships there is a large square deckhouse containing smoking room, and two state-rooms of ample size. The walls of the smoking room are in oak, the ceiling of Tynecastle tapestry and the floor is laid in mosaic. Above the smoking room there is provided for the captain's use a charthouse, handsomely furnished and panelled in polished teak wood. The engineers are berthed abaft the engine room, the officers amidships, and the crew and steerage passengers forward. On the main deck and in the upper and lower main holds, stalls have been fitted for cattle. Electric light has been fitted throughout the vessel by Messrs. W. C. Martin & Co., Glasgow; there are 168 fixed lights of 16 candle-power and two cargo arc lamps of great power are swung from aloft, for use in handling cargo. The current is supplied by a direct driven dynamo with an output of 200 amperes at 65 volts. The engines, which were constructed at Lilybank (the engineering works of the Caledon Co., Limited) are of the triple-expansion type, having cylinders 25 in., 40 in., and 65 in. diameter respectively with a piston stroke of 48 in. There are two single-ended cylindrical boilers, having a working pressure of 160 lbs. per square inch. A separate boiler supplies steam for the cranes and winches. The specifications were drawn up and carried out by Mr. Hamilton, engineer to the company, assisted by Mr. John Wylie, the company's ship surveyor. On leaving the ways the vessel was named *Garmoyle* by Mrs. W. B. Thompson, of Thornbank, Dundee. The *Garmoyle* makes the fourteenth vessel built at the Caledon yard for the Clyde Shipping Co., Limited.

Ægusa.—On December 7th Messrs. Scott & Co., Greenock, launched a handsome new screw steam yacht named *Ægusa*. Dimensions:—Length, between perpendiculars, 264 ft.; breadth, moulded, 31 ft. 6 in.; depth, moulded, 20 ft. 6 in.; yacht tonnage, 1,230 tons. This yacht is built to the highest class in Lloyd's Yacht Registry, and will be fitted with triple-expansion engines of 2,200 H.P. She has a deckhouse 146 ft. in length, containing engine and boiler casing, deck-saloons, smoking-room and staircases to cabins. The shade deck is 60 ft. long, with charthouse and flying bridge. The accommodation for officers and servants is aft, that for the crew forward, and the owners' cabins are forward and aft of machinery space. The yacht is fitted with steam windlass and steam steering gear, and a steam capstan aft. A complete double system of electric light is fitted throughout. There is a large refrigerating chamber amidships. She has been built to the order of an Italian gentleman, and will be a very handsome addition to the large and luxurious fleet of pleasure vessels located in Mediterranean waters. The christening ceremony was performed by Miss Scott, daughter of Mr. John Scott, C.B.

Activ.—On December 8th Messrs. Carmichael, Maclean & Co., Shipbuilding Yard, Greenock, launched an awning-deck steel screw steamer, which they have built for Danish owners, for their China coasting trade. The principal dimensions are:—175 ft. long, by 27 ft. broad, by 13 ft. 6 in. deep to main deck, and 21 ft. to awning deck. She is classed 100 A1 at Lloyd's, and has a gross tonnage of 760 tons. The vessel is constructed of steel throughout, with a cellular double-bottom running the whole length. The main deck is plated and the awning deck is laid with pine. The officers and engineers' accommodation is under bridge, and the saloon and captain's quarters are placed aft in a steel house. There is accommodation for 100 natives in 'tween decks. She has all the latest improvements for the rapid working of cargo. There are 3 steam winches, steering gear amidships, hand gear aft, and side ports for taking in rice, &c. The vessel on leaving the ways was named the *Activ* by Miss Edith Maclean, 4, Princes Gardens, Glasgow. She was immediately towed to Glasgow to receive a set of triple-expansion engines by Messrs. Hutson & Son. The size of cylinders are:—14 in., 23 in., and 37 in. by 27 in. stroke. The vessel during construction has been under the superintendence of Captain Storm. Messrs. Carmichael, Maclean & Co. have two larger vessels on hand, one for Danish owners, and one for Glasgow owners.

Bahdra.—On December 9th Messrs. Russell & Co., Port-Glasgow, launched a steel twin-screw steamer for passenger and cargo service on the river Hooghley. The steamer is named *Bahdra*, and is to the order of Messrs. Morton & Williamson, Glasgow. The dimensions are:—Length, 195 ft.; breadth, 32 ft.; depth, 11 ft. 6 in., moulded; register tonnage, about 600 tons. Two sets of triple-expansion engines will be supplied by Messrs. Rankin & Blackmore, Greenock.

Minerva.—On December 10th Messrs. Russell & Co. launched from Kingston Yard, Port-Glasgow, the steel spar-decked screw steamer *Minerva*, to the order of Mr. John Lockie, Newcastle-on-Tyne. The dimensions are:—Length, 340 ft.; breadth, 46 ft.; depth, 28 ft., and will carry 5,800 tons deadweight. The machinery will be supplied by Messrs. Kincaid & Co., Greenock.

City of Glasgow and the **City of York.**—On December 17th Messrs. Mackie & Thomson, Govan, launched the *City of Glasgow* and the *City of York*, two fish-carriers, of 350 tons, for Messrs. Hagerup, Doughty & Co., Grimsby. Triple-expansion engines will be supplied to each by Messrs. Muir & Houston, Kinning Park.

Hakata Maru.—On December 21st there was launched from the shipbuilding yard of Messrs. David & Wm. Henderson & Co., Partick, a handsomely modelled twin screw steamer, which is a duplicate ship to the *Kanagawa Maru*, launched by them in October last for the same owners, the Nippon Yusen Kaisha, of Tokio. This vessel, as in the case of the former one, has been built under the supervision of A. R. Brown, Esq., Japanese Consul at Glasgow, who has been assisted by Captain Periam for the hull, and Mr. George MacFarlane for the engine department. Her principal dimensions are:—Length, over all, 463 ft.; beam, moulded, 49 ft. 2 in.; depth, moulded, 33 ft. 6 in., and a gross tonnage of about 6,000 tons. Classed in Lloyd's 100 A1 three-deck rule. She has a straight stem and elliptic stern, a poop, bridge, and forecastle, and will be rigged as a four-masted fore-and-aft schooner. Being intended for passsngers as well as cargo, she has got fairly fine ends, which will ensure her being a comfortable sea boat, and at the same time carry a large deadweight and attain an average speed of fully 12 knots on a moderate consumption. Internally the vessel is divided into numerous compartments, there being no less than nine watertight bulkheads, whilst there is a complete double bottom fore-and-aft, also well subdivided, and in addition there is a deep hold tank abaft engine space, extending to height of orlop deck, which can be utilized for cargo or water ballast. The main and upper decks are of steel, the upper deck being sheathed with teak. The first-class accommodation is amidships, the dining saloon under the fore end of the bridge deck is in polished oak, with neat hardwood mouldings, mahogany tables, handsome hardwood revolving chairs, and punkah over each table. Smoking-room is on bridge deck, and has a polished hardwood dado with lincrusta panels above, couches are fitted round the sides, whilst mahogany card-tables and revolving chairs are fitted in centre. The first-class staterooms are mostly on top of bridge-deck, but a few are on upper-deck in vicinity of the saloon; each room is of large size and is complete with berths, spring mattresses, sofa, and patent lavatory. Officers, engineers, doctor, purser, and chief steward are berthed in rooms amidships: they are all of special large size. Separate mess rooms and pantries are provided for officers and engineers. Above bridge deck there is a large teak deckhouse, forming captain's room, chart-room and wheel-house, and the captain's room is a roomy compartment. The chart-room and wheel-house are fitted up as usual, with table, flag lockers, etc. Between poop and bridge there is a large steel deckhouse, forming saloon, state-rooms and pantry for second-class passengers. The state-rooms are furnished in similar style to those of the officers and engineers. A galley for European passengers is fitted at after end of engine casing on upper deck, and is complete with a large cooking range, baker's oven, rice boiler, etc. Saloon pantry, in addition to the usual fittings, has a steam carving table. Poop aft is fitted up with rooms for freight clerks, apprentices, Japanese galley, serving room and scullery, etc., for second-class and steerage passengers. The after 'tween deck is fitted with portable berths for about 150 steerage passengers. Treasure-room, parcel and silk-rooms are also fitted in 'tween decks. The topgallant forecastle is fitted up for seamen, quartermasters, cooks, waiters, crews' galley, wash-houses, etc., and immediately underneath is the quarters for firemen and separate rooms for greasers and donkeymen. The ice-house and cooling-room is fitted in forward 'tween decks. Strict attention has been paid to have the rooms well-ventilated, all lights being of specially large size; nearly all the midship rooms have two lights in each, those on top of bridge deck being Broadfoot's patent swivel lights. A most complete installation of electric light by W. C. Martin & Co., Glasgow, is being fitted throughout the vessel, and includes two engines and two dynamos, Suez Canal search-light, five 100-candle-power deck lights and ten 200-candle-power cargo lights. The cargo hatches are six in number, and for the rapid loading and discharging of cargo there are 12 steam winches and the necessary derricks and cargo gear. There are 12 boats, two of which are of steel. The steam steering gear is of Caldwell & Co.'s make, and is placed aft in poop with angled bars giving a direct lead on to quadrant. Hastie's rudder brake is fitted on rudder, and patent spiral springs are on quadrant. A warping capstan by Clarke, Chapman & Co. is fitted on top of poop deck. The capstan windlass on forecastle head is Napier Bros. latest patent. Dining-saloon, cargo holds, 'tween decks and engine and boiler spaces are all thoroughly ventilated on the Baird-Thompson principle; the upcast ventilators to cargo spaces have patent heads and the downcast ones are of improved construction to prevent water getting below. Chadburn's telegraphs are fitted from bridges to engine-room, to poop and to forecastle head. The machinery will be supplied by the builders' firm, and consists of two sets of triple-expansion engines, each having cylinders, 20 in., 33½ in. and 56 in. diameter by 48 in. stroke; steam is supplied by two large double-ended and two single-ended boilers, constructed for a working pressure of 200 lbs. per square inch. Amongst the auxiliary gear there is Weir's feed heater pumps and evaporator, Murdoch's governor, propellers of manganese bronze, steam ash hoist and all the latest improvements, including Wotherspoon & Davie's feed filter. On leaving the ways the vessel was gracefully named the *Hakata Maru* by Miss A. E. Henderson, 4, Crown Terrace, Dowanhill.

LAUNCHES—IRISH.

Oravia.—On December 5th Messrs. Harland & Wolff launched the large twin-screw steamer *Oravia* from the south end of Queen's Island, Belfast. She is 420 ft. in length, and 48 ft. 6 in. in breadth, and has a gross tonnage of about 5,500. The vessel will have two sets of triple-expansion engines, each of about 2,100 I.H.P. The *Oravia* has been built for the Pacific Steam Navigation Co., and is intended to run in the company's line of mail steamers between Liverpool and the eastern and western ports of South America. Mr. Hugh Brown was present at the launch on behalf of the owners.

Hildago.—On December 5th Messrs. Workman, Clark & Co. launched at Belfast a steel screw steamer, built for Mr. J. E. Ward, New York, and intended for trade in the Gulf of Mexico. The vessel was named the *Hildago*.

Kamakura Maru.—On December 9th was launched from the North Shipbuilding Yard belonging to Messrs. Workman, Clark & Co., Limited, a large steel twin-screw steamer of handsome model and proportions, built to the order of A. R. Brown, Esq., Glasgow, for the Nippon Yusen Kaisha, of Japan, and named the *Kamakura Maru*, and according to Japanese custom on the floating of the vessel, a flock of pigeons became liberated from their temporary home on the bow of the vessel. The principal dimensions of the vessel are:—Length, 445 ft.; breadth, 49 ft. 5 in.; depth moulded, 38 ft. 6 in., with a gross tonnage of about 5,900 tons, built to Lloyd's highest class, and with Board of Trade passenger certificate. The vessel has been specially designed to suit the passenger and cargo trade of the company, and all the most recent improvements in every department have been introduced. A cellular double bottom extends right fore and aft for water ballast, the peaks also being available. The vessel is divided into nine watertight portions, six of these being cargo holds, and another one available for either ballast or cargo. Hold beams have been dispensed with, leaving the holds clear for storage of cargo, &c. Each hold is worked by two powerful steam winches and derricks each capable of lifting six tons, and for heavy lifts up to thirty tons, a large derrick and special winches can be utilised. The derricks are suspended from the masts, of which there are four, and from crane posts. Every facility for the rapid loading and discharging of cargo has been introduced, large gangways arranged in the bulwark opposite each hatch, and folding down on deck, also ports through the vessel's side into each 'tween decks. The safety of cargo has been well assured, each compartment being fitted with fire extinguishing pipes, and the ventilation is most complete, the Baird-Thompson mechanical system being introduced throughout the hold, also in the machinery spaces and saloons. The upper deck of the vessel is of steel, sheathed with teak, and having above it poop, bridge and topgallant forecastle decks, also of teak. The erections being entirely taken up with the passenger and crew's accommodation, &c. In the poop, contained in rooms subdivided by iron partitions are the galleys, bath-rooms, &c., in connection with the steerage which is situated in the after 'tween decks, and is fitted up for about 180 people. The forecastle is arranged for the crew, who have separate baths, galley, &c., for their own use. Across the front of the bridge is placed the dining-saloon, handsomely panelled in white oak, with mouldings and pilasters of different shades of same material and tastefully upholstered in morocco. In wing-houses on each side of the vessel extending the entire length of the bridge are the rooms for the engineers, second class passengers state-rooms, and saloon, &c. These state-rooms are comfortably fitted up with two berths, sofa, patent lavatories, spring wire mattresses and all modern conveniences. On the bridge-deck are built large steel deckhouses for the officers, first-class passengers, and captain. The forward house has in the centre a large companion, with stairway leading down to the saloon, and seats arranged at either side. In front of this are the captain's rooms, extending the full breadth of the house. In the after-house is the accommodation for the officers, doctors, and first-class passengers. All the living rooms throughout the vessel are heated by a service of steam piping. A shade deck of teak extends the whole length of the bridge, and while serving as a complete shelter from the weather also carries six of the lifeboats, the remaining six boats being carried on a deckhouse aft, and on the poop. This shade deck also forms a suitable promenade in fine weather. Auxiliary machinery of a powerful and efficient type is supplied for navigating the vessel, the steering gear being placed in a house inside the poop, and having the chains leading on to a large circle quadrant from angled barrels. This gear is manufactured by Messrs. Caldwell & Co., and is controlled from the flying bridge. A powerful capstan for warping purposes is situated on the poop deck, and driven by steam power. The windlass is a most powerful one of Napier's design, and has a capstan attached. An installation of electric lighting will be fitted throughout by Messrs. W. C. Martin & Co., Glasgow, including Suez Canal search-light, sidelights and powerful cargo lamps at all hatchways for night work. The propelling power will consist of two sets of engines with cylinders 20 in., 33½ in. and 56 in. diameter; stroke, 48 in., with steam supplied from four steel boilers at a pressure of 200 lbs. The work has been carried out under the supervision of Captain T. H. Periam and Mr. McFarlane. After the launch the vessel was placed alongside the jetty to have her boilers placed on board.

LAUNCH—German.

Theben.—On November 21st a passenger steamer, built by the Flensburg Shipbuilding Co. for the Steam Ship Co. "Kosmos," in Hamburg, was successfully launched from the ways. This steamer is built of steel to British Lloyd's 100 A1, third rate. The dimensions are—383 ft. 4 in. by 46 ft. by 30 ft. 8 in. She will have accommodation for thirty first-class passengers. The quadruple engines, of 1.750 I.H.P., are also built by the Flensburg Shipbuilding Co.

TRIAL TRIPS.

Regina.—On November 21st the trial trip of the s.s. *Regina*, built by the Elsinore Iron Shipbuilding and Engineering Co., Elsinore, Denmark, to the order of the Flensburger Steam Navigation Co., of Flensburg, took place in the Sound, and was considered very satisfactory. The vessel is built of steel, and her dimensions are 278 ft. 6 in. by 40 ft. 4 in. by 17 ft. 4½ in. depth of hold. The engines are of the triple-expansion type, with surface condenser, and supplied with feed heater of Lundkvist's system. During the trial trip the engines indicated normally 750 H.P., and the speed was 10 knots.

Nitocris.—On Wednesday, November 25th, the spar deck steamer *Nitocris*, built by Sir Raylton Dixon & Co., Cleveland Dockyards, Middlesbrough, for the Moss Steamship Co., Limited, of Liverpool, was taken out to sea for her official trial trip under the command of Captain Easterbrook. Her dimensions are 320 ft. by 43 ft. 3 in. beam, and 25 ft. depth, moulded, with a deadweight capacity of about 4,200 tons on a light draught of water, and fitted with all latest improvements. The accommodation for captain, officers, and engineers is in houses on bridge deck, and crew in topgallant forecastle. The engines, by Messrs. The North-Eastern Marine Engineering Co., Limited, Wallsend, are of the triple-expansion type, having cylinders 23 in., 36 in., 59 in., by 42 in. stroke, and supplied with steam by two large single-ended boilers working at 180 lbs. pressure, and fitted with Howden's system of forced draught, having duplicate fan-engines and other improvements. The hull and machinery have been constructed under the supervision of Messrs. Wm. Esplen & Son. Mr. William Moss, Mr. Harding, junior, and Mr. Esplen were on board during the trial trip, which passed off most successfully, and the vessel will proceed to Cardiff to load for the Mediterranean.

Winnie.—On November 26th, the new steamer *Winnie*, built by Messrs. John Blumer & Co., of Sunderland, for Messrs. Franz Rahtkens & Co., of Middlesborough, was taken for her trial trip at sea, when her speed, upon a series of runs over the measured mile, was found to be 11¾ knots per hour. The steamer measures 304 ft. between perpendiculars, 44 ft. beam, and 23 ft. 1 in. depth of hold. She is classed 100 A1 at Lloyd's. Her triple engines have been supplied by Messrs. Blair & Co., Limited, of Stockton, and have cylinders of 23 in., 37½ in. and 61½ in. by 39 in. stroke, with 160 lbs. working pressure. The vessel will load about 4,200 tons.

Virago.—On November 27th H.M.S. *Virago*, one of the three destroyers at present on the Clyde, which were built by Messrs. Laird Bros., Birkenhead, went on her full-power official speed trial with very satisfactory results. The mean speed during the three hours' continuous steaming was 30·049 knots, and was based on six runs on the measured mile at Skelmorlie, which came out as follows:—

	Steam.	Time.	Speed.
1st mile..........	210	2.0½	29·88
2nd „	215	1.57½	30·64
3rd „	215	1.58½	30·88
4th „	215	1.56½	30·89
5th „	215	1.58½	30·38
6th „	215	1.56	31·03

The mean speed for the mile was 30.57 knots. The weather outside the Cumbraes was not of the most favourable description for a high result, the sea occasionally being choppy, and clouds of spray breaking over the vessel. During the three hours' steaming "between the lights" was performed in 26 min. 5 sec. against the tide, which shows a speed for the time being of 31·3 knots. Messrs. Welch and Emdin represented the constructive and engineering branches of the Admiralty respectively; and Devonport Dockyard and Reserve, to whom the vessel will ultimately be delivered, were represented by Messrs. Rider and Bath. Mr. T. Pounds, the chief engineer of the vessel, was also present. Messrs. Laird Bros. were represented by Mr. R. Ratsey Bevis, who conducted the trial on their behalf.

Ebro.—On December 2nd the new steamship *Ebro*, the third of three steel screw steamers built by R. Napier & Sons, Limited, for the Royal Mail Steam Packet Co., London, had a very successful trial trip on the Firth of Clyde, when the conditions of the contract were fully implemented. These fine steamships have been specially designed to meet the requirements of the company's extra service to Brazil and the River Plate, and are intended to carry a large cargo, with superior accommodation for first-class passengers and emigrants. The general dimensions are:—360 ft. by 44 ft. by 27 ft. with a top-gallant forecastle, long bridge, and full poop, and a gross tonnage of 3,500. They are fitted in accordance with the Board of Trade regulations for passenger steamers. The upper deck and fittings are of teak, and the most modern appliances have been supplied for the efficient working of the ship and the rapid handling of the cargo. There is a complete installation of electric lighting and refrigerating machinery on the carbonic-anhydride system, with chambers of 7,700 cubic feet capacity for the transport of frozen meat, &c. Superior accommodation has been provided amidships for first-class passengers, and as the ships are intended to trade to tropical climates, the extra large and roomy state-rooms have been placed on the upper deck, which admits of perfect ventilation. Above on the bridge deck is a handsome dining-saloon, finished in polished hardwood and fitted with large sidelights; while overhead the boat-deck forms an admirable shelter, and the bridge-deck a spacious promenade for first-class passengers. Very comfortable accommodation has been provided for 700 emigrants on the main deck. The vessel is built with a cellular double-bottom all fore and aft, and is constructed in accordance with the recommendations of the Bulkhead Committee. The ventilating arrangements throughout the ship are exceptionally complete. The machinery consists of a set of triple-expansion engines, having cylinders 36 in., 42 in., and 70 in. diameter by 4 ft. 6 in. stroke, with three single-ended steel boilers adapted for a working pressure of 180 lbs. The Royal Mail Co. were represented at the trial by Mr. Arthur, the superintending engineer, and Captain Owen, R.N.R., and the results were most satisfactory, a speed of over 14 knots being easily attained.

Laristan.—On December 2nd the fine steel screw steamer *Laristan* went out on her trial trip from West Hartlepool. She has been built by Messrs. Wm. Gray & Co., Limited, to the order of Messrs. Frank C. Strick & Co., Limited, of Swansea and London. The vessel takes Lloyd's highest class, and her dimensions are:—Length over all, 300 ft.; breadth, 42 ft.; and depth 21 ft. 9 in. The deck erections consist of a full poop, bridge over machinery space, and topgallant forecastle. A handsome saloon and cabins for officers, &c., have been fitted up aft, the engineers' rooms are in the bridge, and the crew's accommodation forward. The hull is built on the web-frame system, with a cellular double bottom, large aft peak tank, large hatchways, five steam winches, steam steering gear amidships, hand screw gear aft, large donkey boiler, patent direct steam windlass, boats on beams overhead, shifting boards throughout, stockless anchors, two masts with schooner rig, and a complete outfit for a first-class cargo boat. The engines are of the triple-expansion type supplied by the Central Marine Engine Works of Wm Gray & Co., Limited, and have cylinders 21½ in., 35 in., and 58 in. in diameter, with a piston stroke of 39 in. Steam is supplied by two large steel boilers working at a pressure of 160 lbs. per square inch. After adjustment of the compasses by Mr. Berry the vessel ran out to sea for an hour, everything working in a perfectly satisfactory manner and to the entire satisfaction of the officials on board. The trial was witnessed by Captain Rosser and Mr. A. Walker (under whose superintendence the vessel and her machinery have been built) on behalf of the owners, Captain Bristow, of the Wilson Furness-Leyland Line; Captain Murrell and Mr. T. Mudd representing the builders of the ship and engines respectively. On the conclusion of the trial the vessel proceeded on her voyage to load at one of the Welsh ports.

Begona.—On Thursday, December 3rd, the steel screw steamer *Begona*, built by Sir Raylton Dixon & Co., Cleveland Dockyards, Middlesbro', to the order of Senor Ramon de la Sota, Bilbao, proceeded out to sea for her official trial trip under the command of Captain Victor Landa. Her principal dimensions are:—Length, 315 ft.; breadth, 42 ft. 6 in.; depth, moulded, 22 ft. 5½ in., and has a deadweight carrying capacity of about 4,250 tons on a light draught of water. She is built to Lloyd's highest class, partial awning deck rule, with accommodation for passengers and captain in poop, and for officers and engineers in after end of partial awning deck, with crew and firemen at fore end. Triple-expansion engines are supplied by Messrs. Blair & Co., Limited, Stockton-on-Tees, having cylinders 22½ in., 36½ in., 60 in. by 39 in. stroke, with two large single-ended boilers working at 160 lbs. pressure. The hull and machinery have been built under the personal supervision of Captain Luis de Ybarre, the owner's superintendent.

European.—On December 4th the new steamer *European*, for the West India and Pacific Steamship Co., built by Messrs. Harland & Wolff, proceeded down Belfast Lough for trial and adjustment of compasses. This steamer is sister ship to the *American* (for the same company), which left some months ago and is also intended for service between Liverpool and New Orleans. The two vessels will be by far the largest cargo-carriers at present engaged in that trade. The ship is 475 ft. in length, 55 ft. breadth, 32 ft. 0½ in. deep, and her total tonnage 8,195. She has four masts, is schooner rigged, and fitted up with the most approved appliances for the working of ship and cargo, as well as with a complete installation of electric light. She is a twin-screw steamer, and her machinery consists of two sets of triple-expansion engines constructed by the builders. The owners were represented by Captain Baker (the marine superintendent) and Mr. Gordon (superintendent engineer); and the vessel is commanded by Captain Wallace. After a satisfactory trial the ship left for Cardiff.

Unison.—On December 4th, the steamer *Unison* proceeded to sea for the purpose of a trial of her machinery, after undergoing extensive alterations and repairs. The old boilers have been taken out and a new high pressure boiler fitted, thus effecting a large saving of deadweight and space, and allowing of a corresponding increase of carrying capacity. The engines also have been altered to the high pressure compound system to suit the new high pressure boiler. This vessel was recently purchased by Messrs. Roed, M'Nair & Co., of Glasgow, who have had the above alterations carried out, as also extensive repairs and additions effected to the hull, &c., so as to bring the vessel up to the requirements and highest classification of Det Norske Veritas Registry. The whole of the work to both machinery and hull has been carried out by the North-Eastern Marine Engineering Co., Limited, at their Wallsend Works. The trial proved very successful, the machinery working throughout to the entire satisfaction of all present. The mean speed attained on the measured mile at Whitley was 9·9 knots. There were present during the trial a number of shipowners and other interested gentlemen, amongst whom were Messrs Roed & M'Nair (the owners), Mr. Bodin (chief surveyor of Det Norske Veritas), Mr. Macfarlane (consulting engineer), who has superintended the alterations on behalf of the owners, and Mr. D. Myles (works manager of the North-Eastern Marine Engineering Co., Limited. After the trial the *Unison* proceeded for Christiania under the command of Captain Thorbjornsen.

Kanagawa Maru.—On Thursday, December 10th, the large twin-screw steamer *Kanagawa Maru*, 5,824 tons gross, built by Messrs. David and William Henderson & Co., Partick, for the Nippon Yusen Kaisha, of Tokio, went down the river and ran her speed and coal consumption trials on the two following days. During the three days the machinery worked admirably, with great regularity and smoothness, and gave the utmost satisfaction to the owners' representatives, who were on board. A mean speed of over 14 knots was easily obtained, and this being considerably over the guaranteed speed, more than realised the anticipations of owners and builders. It will be remembered that this is the first of ten steamers which are being built in this country for the same owners through their representative, A. R. Brown, Esq, Japanese Consul, Glasgow.

Presidente.—On December 11th the gunboat yacht *Presidente*, of San Domingo, went down the Forth on her official trial, after being practically renewed in everything except the orginal iron shell-plating and framework, and fitted with powerful new triple-expansion engines of the most modern type. The work has been done to the order of Messrs. Frame, Alston & Co., of London, representing the Dominican Government under the joint superintendence of Mr. George Macfarlane, Glasgow, and Mr. N. MacNicoll, of Messrs. MacNicoll & Co., Glasgow, the contractors being the Grangemouth Dockyard Co., Limited, Grangemouth, who entrusted Messrs. Hutson & Son, Glasgow, with the construction of the machinery. The highly satisfactory speed of 13¾ knots was got with easy steam and everything working smoothly. This steamer is longer than the *Restauracion*, lately built for the Dominican Government, being about 205 ft. between perpendiculars, but she has less beam. She is armed with seven Hotchkiss guns, four in barbettes, one at bow and two at stern. She has a beautiful clipper bow with billet-head and scroll-work, elliptic stern and very fine lines, two decks, the upper of teak. The original wooden bulwarks replaced with steel-plating, steam windlass, steam steering gear, electric lighting and search-light. Sumptuous apartments below aft for the President and his guests, spacious accommodation amidships for officers, large forecastle for crew. Magazine and store-room below, long steel-plated deck-house and casings, with rooms for captain and engineers, and side-houses under steering bridge. There was a large company on board, including Mr. Frame, of Messrs. Frame, Alston & Co.; Mr. Taylor, Consul, Mr. Mellish, Vice-Consul, and Mr. Gueser, special commissioner from the Dominican Government.

Yearby.—On Saturday, December 12th, the s.s. *Yearby*, another trunk steamer built by Messrs. Ropner & Son, under the patent of Mr. R. Ropner, jun., made her official trial trip. She left the River Tees, and after the compasses were adjusted in the Tees Bay had a very satisfactory run to the Tyne. The owners were well represented, and expressed themselves well pleased with the results of the trial. The engines worked very smoothly and without a hitch, and a good rate of speed was easily maintained.

Berandan.—On December 15th the trial trip of the s.s. *Berandan*, built by the Grangemouth Shipbuilding Co. for Dutch owners, took place on the Firth. The vessel is a tank steamer, built to carry oil in bulk, and it is intended to use coal or oil as fuel alternately as required. The trial was watched with much interest by a number of gentlemen on behalf of the owners and others on account of the novelty in firing the boilers with liquid fuel. All on board expressed great satisfaction at the very successful result of the trial. The boilers are fitted on board by Messrs. A. & C. Stewart, Port Eglinton, Glasgow. A three hours' trial was made with coal firing, and afterwards three hours with oil, with very satisfactory results, the change from coal to oil being made instantly without any alteration of furnace, and either system can be worked with ease and facility.

Teniente Serrano.—On December 16th Messrs. Laird Brothers took out for her official full-speed trial the *Teniente Serrano*, the third vessel of the four which they are building to the order of the Chilian Government. The results were eminently satisfactory, both in regard to the speed on the measured mile and the steadiness of running during the three hours continuous steaming. The particulars of the six runs on the mile are as follows:—

Miles.	Steam.	Time	Speed.
1st	208	2.1½	29·64
2nd	210	1.59½	30·12
3rd	210	1.59	30·26
4th	208	1.57	30·77
5th	205	1.59	30·26
6th	205	2.0	30·00
Means	206	—	30·35

The mean speed for the three hours continuous steaming was 30·25 knots. After the full-speed trial the anchor trials were successfully carried out. The Chilian Naval Commission was represented by Captain Barrientos, in the unavoidable absence of Admiral Luis Uribe and Sir Edward J. Reed, their technical adviser, who, however, was represented by Mr. J. H. Wells. Lieutenant Raby, of the *Esmeralda*, was also on board. The contractors were represented by Mr. R. Ratsey Bevis, junr.

Urania.—On Saturday, December 19th, the s.s. *Urania*, built by Messrs. Craig, Taylor & Co., Thornaby-on-Tees, for Tommaso Cossovich, Esq., of Trieste, was taken to sea for her trial trip, which proved highly satisfactory. The dimensions of the boat are 280 ft. by 41 ft. by 18 ft. 9 in., and she will carry 3,100 tons on a very light draught of water. The engines, by Messrs. Sir Christopher Furness, Westgarth & Co., Limited, Middlesbro', are 20 in., 32½ in., 53 in. by 36 in. stroke, with two boilers working at 160 lbs. pressure. The hull and machinery have been built under the supervision of Jas. C. Clarke, Esq., consulting engineer and marine surveyor, West Hartlepool. After adjusting compasses the vessel at once proceeded to the Tyne to load.

Catalogue.—We have received from Messrs. Thos. Richardson & Sons, of Hartlepool, two well-got-up and profusely illustrated volumes on the subject of Morison's Evaporators. These well-known economical appliances are manufactured in three types. These are the "Steel Dome" type, the "Radial," and the "Navy" type. The first is the original invention and has been fitted to no less than seven hundred steamships in the seven years which have passed since it was brought out. Three years ago it was followed by the "Radial" type, which is adapted for economisation of labour on the part of those in whose charge it is placed. The great feature of this type seems to be the ease with which it can be cleaned and so kept in its maximum state of efficiency and usefulness. This type is made in various sizes, and is largely fitted to yachts and steam trawlers. The Navy type aims at combining the good points of the Radial evaporator with a great economy of weight to suit the hard conditions of the Admiralty. The first volume of the two submitted to us contains illustrated descriptions of these three sorts of evaporators, with explanations of their various parts and the methods of fitting, and of using them so as to obtain the best practical results. It also contains a description of another appliance, or rather of a special adaptation of the original one, made to suit the special needs of a large class of shipowners in the Mercantile Marine. We refer to the combined radial evaporator and winch condenser. This, as its name indicates, is intended for use in port when the main condensers are not being worked. The second volume consists chiefly of a compilation from a paper read by Mr. D. B. Morison before the Liverpool Engineering Society. It shows the need and value of the evaporator by proving the amount of waste of fuel through the accumulation of scale. The evaporator prevents such accumulation, and so tends at once to save coal and to prolong the life of the boiler.

American contracts have been made for the building of lake vessels this winter as follows:—Chicago Shipbuilding Co., steel freight-steamer, 400 ft. long, for A. R. Wolvin of Duluth; two steel steamers, Nelland Canal size, 2,700 net tons capacity, for Robert S. Rhodes, of Cleveland; one steel tow barge, largest lake, size for C. W. Elphicke, of Chicago; Cleveland Shipbuilding Co., steel steamer, 400 ft. long, for Captain Thos. Welsh, of Cleveland; Globe Iron Works of Cleveland, steel tow barges of largest lake size for Bessemer Steamship Co., a steel steamer to cost 120,000 dols., for O. W. Blodgett of Bay City, a wooden steamer 270 ft. keel for James Davidson, West Bay City; Union Dry Dock Co., Buffalo, steel oil tank barge for Standard Oil Co.

Summary of Shipbuilding Returns of United Kingdom in 1896 arranged in order of Tonnage built by each Firm.

	Name of Firm.	Place.	No. of Ships.	Total Tons.
1	Harland & Wolff	Belfast	12	81,316
2	Sir Wm. Armstrong, & Co., Ltd.	Tyne	20	54,157
3	Wm. Gray & Co., Ltd	Hartlepool	17	43,545
4	Charles Connell & Co.	Clyde	12	40,864
5	Ropner & Son	Tees	16	40,260
6	C. S. Swan & Hunter	Tyne	11	39,608
7	Wm. Doxford & Son, Ltd	Wear	11	39,533
8	Workman, Clark & Co.	Belfast	12	38,340
9	J. L. Thompson & Sons, Ltd.	Wear	11	37,323
10	Palmer's Shipbuilding Co.	Tyne	12	36,185
11	Sir Raylton Dixon & Co.	Tees	20	36,111
12	A. Stephen & Sons	Clyde	9	35,185
13	Wm. Denny & Bros.	Clyde	34	32,677
14	Short Bros.	Wear	12	32,321
15	Furness, Withy & Co.	Hartlepool	10	31,603
16	Fairfield ShipbuildingCo.Ltd.	Clyde	5	29,987
17	Russell & Co.	Clyde	17	29,116
18	D. & W. Henderson & Co.	Clyde	7	28,081
19	R.&W.Hawthorn, Leslie & Co. Ltd.	Tyne	9	26,088
20	Barclay, Curle & Co., Ltd.	Clyde	8	25,223
21	Wigham Richardson & Co.	Tyne	10	24,257
22	London and Glasgow Shipbuilding Co.	Clyde	5	23,221
23	James Laing	Wear	11	22,600
24	J. Readhead & Sons	Tyne	8	22,541
25	Richardson, Duck & Co.	Tees	25	21,777
26	Caird & Co., Ltd.	Clyde	4	20,842
27	Laird Bros.	Mersey	14	19,266
28	Scott & Co.	Greenock	9	18,638
29	John Priestman & Co.	Wear	7	17,707
30	Tyne Iron Shipbuilding Co.	Tyne	5	17,691
31	Wm. Hamilton & Co.	Clyde	7	15,855
32	Naval Construction & A. Co.	Barrow	7	14,654
33	J. Blumer & Co.	Sunderlan	7	14,304
34	Bartram & Sons	Wear	4	14,113
35	Earle's Shipbuilding Co., Ltd.	Humber	8	13,428
36	W. Dobson & Co.	Tyne	8	13,246
37	Thames Ironworks & Shipbuilding Co., Ltd.	Thames	1	12,500
38	A. McMillan & Son. Ltd.	Clyde	12	12,450
39	R. Napier & Sons	Clyde	4	12,100
40	Sunderland Shipbuilding Co.	Sunderland	6	11,839
41	A. Rodger & Co.	Clyde	8	11,504
42	S. P. Austin & Son	Sunderland	5	10,602
43	J. & G. Thomson, Ltd.	Clyde	10	10,492
44	Lobnitz & Co., Ltd	Renfrew	16	8,479
45	Simons & Co., Ltd	Clyde	10	8,260
46	Irvine & Co.	Hartlepool	5	8,151
47	R. Craggs & Sons	Tees	16	7,844
48	Mackie & Thomson	Clyde	31	7,468
49	Robert Thompson & Sons	Wear	4	7,360
50	John Reid & Co., Ltd.	Clyde	17	6,464
51	Fleming & Ferguson	Paisley	10	6,000
52	W. Pickersgill & Son	Wear	2	5,763
53	Wood, Skinner & Co	Tyne	5	5,550
54	A. & J. Inglis	Clyde	4	5,033
55	Ailsa Shipbuilding Co.	Troon	6	4,943
56	Osbourne, Graham & Co.	Wear	2	4,754
57	Cochrane & Cooper	Beverley	30	4,667
58	Edwards Bros.	Tyne	29	4,563
59	Campbeltown Shipbdg. Co.	Campbeltown	3	4,385
60	Craig, Taylor & Co.	Tees	3	4,322
61	Cook, Welton & Gemmell	Hull	27	4,184
62	John Scott & Co.	Kinghorn	5	3,386
63	Alley & Maclellan	Clyde	11	3,300
64	Murdoch & Murray	Clyde	8	3,221
65	Blyth Shipbuilding Co., Ltd.	Blyth	1	3,132
66	David J. Dunlop & Co.	Clyde	6	3,010
67	Hall, Russell & Co.	Aberdeen	5	2,992
68	A. W. Robertson & Co.	Thames	34	2,923
69	Gourlay Bros. & Co.	Dundee	4	2,774
70	R. Duncan & Co.	Clyde	3	2,677

Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—ED. M. E.]

BOILEAU'S TRAVERSE TABLES.

To the Editor of THE MARINE ENGINEER.

DEAR SIR,—We regret to find that there is an error in the seventh edition (1896) of Boileau's Traverse Tables. On page 20, 9° 52′ lat. 8, for 7.86167, read 7.88167. As many of your readers are using this work, we shall be greatly obliged if you would inform them in your columns, so that the error may be corrected.

Yours faithfully,
W. H. ALLEN & CO., LIMITED.

13, Waterloo Place,
London, S.W.

QUALIFICATIONS FOR SECOND ENGINEERS.

To the Editor of THE MARINE ENGINEER.

DEAR SIR,—In your issue for September I see that the Board of Trade Committee have brought a rule to be passed, that marine engineers had to serve five years in an engineers shop before they could pass a second engineer's certificate. I should like to know if that rule has been passed, as I have served a period of five years in a stationary engine works, and two years in an engineer's repairing works, and would like to go to sea.

I remain, yours,
W. W.

December 20th, 1896

[The qualifying period of service in the workshop, as the rules are now framed, are as follows (paragraph 35, Exn. 1 a.):—"He must have served an apprenticeship to an engineer for three years at least and prove that during the period of his apprenticeship he has been employed on the making and repairing of engines; or, if he has not served an apprenticeship, he must prove that for not less than three years he must have been employed as a journeyman mechanic in some factory or workshop on the making or repairing of engines (these may be either land or marine engines). In either case he must also have served one year at sea in the engine-room as an engineer or regular watch in the foreign or coasting trade."

There is an agitation on foot for making the period of apprenticeship five years, but it has not actually become law at the time of going to press, and we should recommend, if you meditate going to sea, to communicate with Mr. J. Hawthorn, principal of the Marine Engineering Academy, 41, East India Road, London, E., who will be pleased to answer any enquiries further on this subject.—ED. M.E.]

Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships, from October 9th, to December 2nd, 1896.

21171	H. Hopton. Thrust blocks for propellers.
21185	W. G. Koppe. Folding boat.
21215	D. B. Morison. Water gauges.
21259	C. Grayson and W. J. Thompson. Steam generators.
21275	A Racic. Life-belts.
21302	E. H. J. C. Gillett. Sectional steam boilers.
21306	G. H. Jones. Defence against torpedoes.
21358	H. H. Griffin and J. M. Hale. Paddle-wheel propellers.
21359	H. H. Griffin and J. M. Hale. Cycle boats.
21375	A. A. Humphrey. Rotary engines.
21387	C. Groll. Smoke-consuming furnaces, &c.
21393	L. Thuck. Steam packing for stuffing-boxes.
21400	T. B. Marchant. Improved steam boilers.
21404	E. Wood. Construction of ships.
21411	J. Pearson. Supplying air to furnaces
21447	R. J. White. Distributing steam pressure.
21489	J. Thom. Steam engines.
21501	K. Leverkus. Friction clutch for belting.
21503	A. Boyd. Rotary motive power engines.
21508	G. W. Allen. Removing scum from boilers.
21513	J. C. W. Lloyd. Water-tube boilers.
21567	L. C. Wallach. Reflector for water gauges.
21582	G. A. Chaddock. Fastenings for ships' hatches.
21589	J. Herbert. Bearings.
21595	H. B. and J. S. Watson. Feed-water filters.
21623	J. L. Grandison. Sight-feed lubricators.
21635	C. Twining. Sailing apparatus.
21649	C. C. Wakefield. Sight-feed lubricators.
21718	P. W. Brown and P. A. F. Pratt. Valves.
21725	J. F. Service. Water gauge glasses for boilers.
21746	S. Hunter and G. D. Weir. Tubulous steam boilers.
21805	W. Reeves and the Reeves Patent Filters Co., Limited. Filtering liquids.
21834	A. Heberer. Multitubular steam generators.
21856	W. H. Scott. Steam engines.
21873	C. J. Bishop. Water gauges for boilers.
21875	W. A. Legg. Watertight bulkhead doors.
21877	R. Hornsby & Sons, Limited. (C. W. Burton, France.) Speed regulator.
21928	H. Wilcke. Steam generators.
21929	W. G. Gibbons and A. A. Jude. Stop valves.
21940	T. Sudron. Trawling apparatus.
21943	W. Fitzer. Boats' davits.
21964	Tangyes, Limited, and W. Johnson, jun. Steam generators.
21967	F. Lamplough and F. T. Goodman. Steam generators.
21971	G. Tabourin. Propelling ships and boats.
21987	G. P. Grace. Steam-tight engine packing.
22003	E. Woods. Marine or propeller engines.
22017	J. Holland and E. and J. Holding. Speed check.
22074	R. S. McLaren. Lubricating engines, &c.
22081	R. Philip. (J. Philip, United States.) Engine shaft thrust blocks.
22099	L. C. McAdams. Engines.
22117	L. J. Franklin. Shipping and hanging rudders.
22169	H. W. Ibbotson. Saving vessels at sea.
22186	J. G. Pike and R. W. Wright. Steam engines.
22193	A. C. Lippincott. Steam indicator diagrams.
22212	E. Phillips and F. W. Vallat. Internal combustion engines.
22224	F. J. Trewartha. Holding open cabin doors.
22270	J. Thom. Steam engines.
22301	J. Lodge and W. H. Morris. Propelling steamships.
22328	J. H. Tangye and W. Johnson, jun. Steam engine.
22338	H. H. Lake (M. F. Elliot, United States). Furnaces.
22343	F. Hamer. Steam engine.
22417	L. Wimmer. Water gauges.
22429	J. Slee. Steam pumps.
22454	H. W. Metcalfe. Speed indicators for engines.
22462	W. J. Gordon. Sand pump suction tubes.
22475	J. Kay. Bulwark for steamboats, &c.
22511	S. Schulz. Boilers.
22513	J. M. Barr and C. E. S. Phillips. Cables.
22545	B. G. Sinclair. Furnaces.
22546	G. A. Chaddock. Ships.
22566	A. G. Brown. Expansion joint for steam pipes.
22579	W. H. Serjeant. Propeller for ships' boats.
22625	W. A. Feurtado. Protection of ships.
22631	N. Chandler. Single-acting engines.
22636	W. J. Tarrant. Dredgers.
22664	W. Corke. Steam heating apparatus.
22670	S. E. Alley. Steam engines.
22678	T. W. Beverley. Internal combustion engines.
22699	S. D. Thorson. Steamboats.
22700	A. J. B. Body. Submarine torpedo boats.
22713	H. R. Cassel. Disinfecting ships and other structures.
22739	L. Lang and H. Horbiger. Valves.
22763	J. J. Tinker. Water-tube steam generators.
22801	E. J. Pennington. Internal combustion engines.
22806	J. L. B. Templer. Seamless metallic tubes.
22809	A. Walter. Facilitating nautical ca l
22814	Transportaktiebelaget for lefvande fisk. Boats for transporting fish.
22854	T. Taylor. Making of tubes.
22865	C. D. Augur. Apparatus for propelling boats.

22871 W. Simpson, W. L. Bodman, and D. H. Simpson. Furnaces of steam generators.
2872 W. Simpson, W. L. Bodman, and D. H. Simpson. Construction of steam generators.
22888 J. Crow. Filters for boiler feed-water.
22923 W. Beardmore and H. V. Holden. Casting armour plates.
22939 H. E. J. Camps. Metal bars for ships' bridges.
22964 G. Salter. Pressure gauges.
22976 D. C. Dalzell and A. Fairley. Annealing steel.
22977 J. Gilligan. Heating boiler feed-water.
23033 J. Thom. Steam engines.
23060 J. Brown. Variable speed transmitting gear.
23080 R. Chalmers. Water gauge glass shields.
23218 T. and W. L. Cole. Sight tube for lubricators.
23226 R. H. Smith. Valve gear for cylinders.
23254 C. Mansell. Marine locomotion.
23292 W. P. Thompson (G. J. N. Carpentier, United States). Boilers.
23320 W. D. Ferguson. Valve gear for steam engines.
23345 F. Lobnitz. Dredging machinery.
23355 J. W. Vause. Propelling steamships.
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23439 J. T. Gibbons. Watertight bulkhead door.
23442 J. Bonthrone. Steam generators.
23446 K. F. Lindstram. Non-fouling composition.
23458 W. Bellhouse. Piston for use in steam, &c., engines.
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23768 G. J. Glover. Ship lubricating apparatus.
23776 F. O. Prince. Internal combustion motors.
23807 W. G. Clegg and A. Harris. Steam boilers.
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23898 F. Baldt. Anchors.
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23986 F. G. Bennett and D. Wood. Heating steam generators.
24000 G. Paley. Regulator for steam engines.
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24068 W. Connell. Improved otter and beam trawls.
24091 J. T. Dawes. Internal combustion engines.
24100 L. Richards. Exhaust steam condenser.
24142 H. Watson. Ascertaining the draught of ships.
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24213 J. and H. Jelley and A. S. Bowley. Valves.
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24299 D. Hunter. Preventing fire in ships, &c.
24311 J. T. Dawes. Internal combustion engine.
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24752 A. Craig. Internal combustion engines.
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25246 G. H. Biddles. Destroying smoke in boilers.
25287 J. Gilmour. Improved water-tube boilers.
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25709 R. D. L. Clarke (G. Holford, United States). Lowering ships' boats.
25719 H. H. Lake (Cie. de l'Industrie Electrique, Switzerland). Steam boilers.
25748 H. Sidebottem. Screw of a vessel.
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25985 A. and C. Stewart, and J. Farmer. Boiler.
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26095 F. Lobnitz. Hopper dredgers.
26098 G. Jones and A. McGlashan. Steamships.
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26150 C. S. Allan. Submarine boats.
26151 C. S. Allan. Torpedoes.
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26364	J. Ewer. Ship boats.
26371	J. P. Davies. Steam boilers.
26398	H. Gohrig. Water-tube boilers.
26403	P. Spaeth. Feedwater Heaters.
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26560	A. McGlashan. Cargo-carrying vessels.
26593	F. O. Prince. Reversing propellers for boats.
26606	E. E. Wigzell. Engines.
26634	J. J. Bates. Propeller shafts.
26642	J. H. Voorhees. Cleaning boiler tubes.
26656	A. C. A. Craufurd. Lubricating bearings.
26669	R. Haddan (The Societe "L'Insubmersible" Directeur Gerant M. Bruel). Preventing ships sinking.
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26977	W. P. Thompson (G. Veronese and A. Guadagnini, Italy). Compasses.
26988	M. Deprez. Tubular steam boilers.
27034	H. Simpson. Propelling of vessels.
27042	R. Pollock. Engines.
27090	W. P. Thompson (F. Guidi, Italy). Furnaces.
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27268	C. D. Doxford. Vessels.
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November 14th, 1896.

Angus, R.	2C	Greenock
Arnott, J. H.	1C	,,
Barclay, W. G.	1C	Liverpool
Chipchase, J. W.	2C	N.Shields
Davies. J.	2C	London
Donovan, J. J.	1C	N.Shields
Duncan, A.	1C	,,
Ferrier, D. G.	1C	Greenock
Gilbert, C. W.	2C	London
Graham, D.	2C	Greenock
Graham, J. W.	2C	,,
Gray, D.	2C	N.Shields
Hurst, H.	2C	,,
Johnston, D. T.	1C	Liverpool
Jones, F. M.	2C	London
Kaine, W. C.	2C	N.Shields
Mahan, W. S. A.	2C	Greenock
McIntosh, F.	1C	,,
Merchant, C.	1C	,,
Messenger, E. E.	1C	London
Phillips, B.	2C	N.Shields
Richardson, F.	2C	,,
Roberts, John F.	2C	Liverpool
Robertson, D.	1C	Greenock
Robertson, J.	2C	London
Snape, Jos. W.	2C	Liverpool
Ward, J.	2C	Greenock
Watson, R.	1C	London

November 21st, 1896.

Atkinson, W. R.	2C	W.H'pool
Barten, W. H.	2C	Lon'derry
Beck, R. S.	1C	N.Shields
Blench, W. A.	1C	W.H'pool
Boagey, J.	1C	,,
Brown, J. G.	2C	Aberdeen
Cameron, G.	2C	Glasgow
Cowan, J. H.	1C	,,
Coxon, S. C.	2C	N.Shields
Davies, T. O.	1C	Cardiff
Dixon, E. C.	2C	London
Duncan, G. G. C.	2C	,,
Dunlop, G. D.	1C	Glasgow
Evernden, A. S.	1C	London
Fisher, T. S.	2C	Hull
Frame, A. F.	2C	Glasgow
Gray, Hugh	1C	Liverpool
Greenshields, R.	1C	Glasgow
Greig, C.	2C	W.H'pool
Griffiths, G. H.	2C	Cardiff
Harcus, A. C.	2C	Aberdeen
Harrison, J. W.	2C	Hull
Heavisides, E. W.	1C	W.H'pool
Hope, T. E.	1C	,,
Hooper, R. L.	1C	W.H'pool
Iley, J. G.	1C	,,
Jenkins, D.	2C	,,
Kerr, Andrew	1C	Liverpool
Kirk, W.	2C	W.H'pool
Laidler, J. W.	1C	N.Shields
Lennox, A.	2C	Glasgow
McCarthy, J.	2C	Cardiff
McMillan, J. A.	2C	Glasgow
Miller, J. M.	1C	,,
Morgan. J.	1C	London
Naismith, T. P.	1C	Glasgow
Nielsen, N. A.	2C	Cardiff
O'Brien, B.	2C	,,
Patterson E.	2C	Glasgow
Philips, R.	1C	Aberdeen
Pile, J. B.	1C	Cardiff
Pittas, J. N.	2C	,,
Ross, A.	1C	Aberdeen
Smith, J. S.	2C	,,
Smith, W.	1C	Plymouth
Smith, W. A.	2C	Glasgow
Swales, S.	2C	W.H'pool
Umpleby, J.	2C	,,
Vlassopulos, E.	2C	Cardiff
Wake, E.	2C	,,
Walker, D.	2C	Glasgow
Walker, J.	1C	London
Watt, W. H.	2C	W.H'pool
Watts, F. H.	1C	London
Webster, R. J.	2C	Glasgow
Williams, A. S.	2C	Cardiff
Wilson, A.	2C	Glasgow

November 28th, 1896.

Arter, W. L.	2C	Liverpool
Barkness, R.	2C	N.Shields
Bartlett, Bond	2C	Liverpool
Billington, T.	2C	,,
Borthwick, J. A.	2C	London
Campbell, N.	2C	,,
Crerar, John E.	2C	Liverpool
Dunsmore, J.	2C	London
Gargalos, C. G.	2C	Liverpool
Humble, R.	2C	S'nd'land
Jobling, T. L.	2C	N.Shields
Kingcombe, G. E.	2C	London
Landrum, J. R.	2C	Liverpool
Lochhead, A.	2C	N.Shields
Mannox, W.	2C	London
Marshall, J. A.	2C	S'nd'land
McGregor, R.	2C	London
Robertson, A.	2C	,,
Skelton, J. C.	2C	,,
Southwell, W. J.	1C	S'nd'land
Stoddart, F.	2C	,,
Tidey, H.	2C	Liverpool
Tyroll, C.	1C	London
Wastoll, R. T.	2C	N.Shields

December 5th, 1896.

Anderson, J. G.	2C	Leith
Bass, J. W.	1C	London
Bathgate, A.	2C	Leith
Bowie, R.	1C	Greenock
Candlin, H. B.	2C	Glasgow
Charles, D. C.	1C	Cardiff
Clephane, A.	2C	Leith
Crawford, W.	1C	Glasgow
Crighton, John	2C	Liverpool
Fearn, F. H. P.	2C	Glasgow
Fraser, D. J.	2C	,,
Henderson, W.	2C	London
Hine, J. McJ.	2C	Leith
Huntley, F.	2C	Cardiff
Kennar, Geo. W.	1C	Liverpool
Lace, C. J.	2C	Cardiff
Lambie, D.	1C	Glasgow
Leask, R. L.	1C	Leith
Lennox, W. G.	1C	Glasgow
Logan, R. P.	1C	Greenock
M'Cutchion, A.	2C	Glasgow
McDonald, W.	2C	London
McEwan, A. D.	2C	Glasgow
McGuire, J.	2C	Greenock
McKeddie, J. G.	1C	Glasgow
Miller, James	2C	Liverpool
Muir, J. B.	1C	Glasgow
Park, T.	1C	,,
Robinson, H. J.	1C	,,
Shaw, T.	1C	Cardiff
Smeal, J.	1C	Glasgow
Turner, E. H.	1C	London
Waddingham, T.	2C	Hull
Walker, J.	2C	,,
Whyte, J.	1C	Glasgow
Wolf, Joseph	2C	Liverpool
Wright, J.	1C	London

December 12th, 1896.

Barry, W.	1C	Dublin
Bolton, R. H.	1C	N.Shields
Craig, R	2C	Dublin
Crighton, J.	1C	Liverpool
Hamilton, R.	2C	Dublin
Harvey, F. S.	2C	London
Jackson, W. J.	2C	Dublin
Jones, J. E.	2C	London
Kenna, G. W.	1C	Liverpool
Mason, A.	2C	London
Miller, J.	2C	Liverpool
Montgomery, T.	1C	N.Shields
Osser, W.	1C	Dundee
Palmer B. J.	1C	London
Robson, W.	1C	N.Shields
Scheviz, J.	1C	,,
Scott, E. W.	1C	London
Sinclair, C. R.	2C	N.Shields
Southern, W.	1C	,,
Wolff, J.	2C	Liverpool

Messrs. R. & H. Green, Blackwall, have built an iron floating pier for Gravesend, and are now constructing three Hopper barges for the Board of Trade, to carry 200 tons each.

The Anti-Attrition Metal Co., Limited, of Emerson Street, Southwark, London, request us to state that Mr. Stephen Humble, junr., has no longer any connection with that company.

Floating Graving Dock.—The Spanish Government has decided to install a floating dock in the harbour of Havana for the purpose of docking any of her warships in those waters. The new dock, which is to be capable of lifting a ship weighing 10,000 tons in two and a half hours, will be from the designs of Messrs. Clark & Standfield, of Victoria Street, Westminster. It will be built at Wallsend in the yard of Messrs. Swan & Hunter, and is to be delivered ready for work in Havana within 11 months. The type of dock selected by the Spanish Government is Messrs. Clark & Standfield's floating graving dock.

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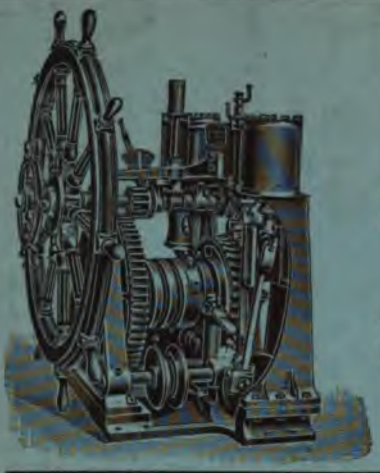

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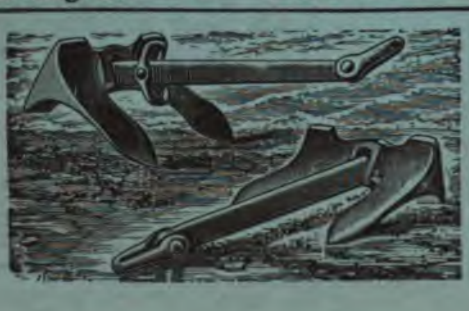

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The Marine Engineer.

LONDON, FEBRUARY 1, 1897.

IT would appear, from the practical discussion, ensuing in the Shipmasters' Society on the able paper upon the legal duties of the shipmaster at home and abroad, which was the basis of an editorial note in our December issue (the said paper was contributed to the society by Benedict W. Ginsburg, LL.D.), that the practical state of affairs affecting the duties of ship-masters differs considerably from their theoretical legal position as is laid down. In the opinion of Capt. Chandler, the financial part of a shipmaster's duty is almost a thing of the past, but in many instances his present position is a humiliating one. He is made the butt and target for everyone's delinquencies. With regard to the cargo, the shipmaster has to satisfy three conflicting interests: that of the shipowner, the owner of the cargo, and the buyer, and apparently no amount of tact will enable him to satisfy all three. Hence we presume, like an arbitrator, he must consider he has most impartially done his duty when he has somewhat dissatisfied all. As Capt. Chandler says, this appears to be an unfortunate state of affairs, but we presume ship-masters get used to it. Capt. H. S. Thompson also feels very strongly that there is practically no way in which discipline can be legally and readily enforced in the Merchant Service, and that masters are very often obliged, where urgent and unexpected need arises for special and unusual services, to use means which have never been contemplated by statute, and which might even not seem legally reasonable. As a case in point, Capt. Thompson instanced one where a passenger had to be isolated in consequence of an outbreak of small-pox, on which it became necessary to isolate another man to look after him; no one would volunteer, so someone had to be forced to do it. This was apparently outside articles of agreement, or foreseen legal eventualities, but it had to be done. The stewards were pressed to provide a volunteer, they refused, and it was only after they had been claimed up all night and part of the next day that eventually one of them volunteered. Captain Froud points out that too often by a clause in charters arranged between owners and charterers, the master is compelled to be guilty of illegal acts, in the form of signing bills of lading, where if anything eventually turned out wrong, the action of the master might be characterised by the judges as fraud. This is a point that such a society as this might well agitate to have amended, since also such amendment that no goods should be signed for, that are still in the warehouse, but only when in possession of the steamer, alongside, or at the loading berth, would be proper protection for bankers, whilst keeping the master on the right side of the hedge, and no inconvenience to anyone except to those who may be financially sailing too close to the wind. As the newly-elected President, Sir Chas. Dilke, said in conclusion, "The ship-master comes more in contact with the law at any turn, than any other profession, with the possible exception of the mine manager." The valuable paper by Dr. Ginsburg had brought out some most interesting points as to the dilemmas of masters, and the moral of it was, that ship-masters should combine and discuss to raise their status, and define their responsibilities.

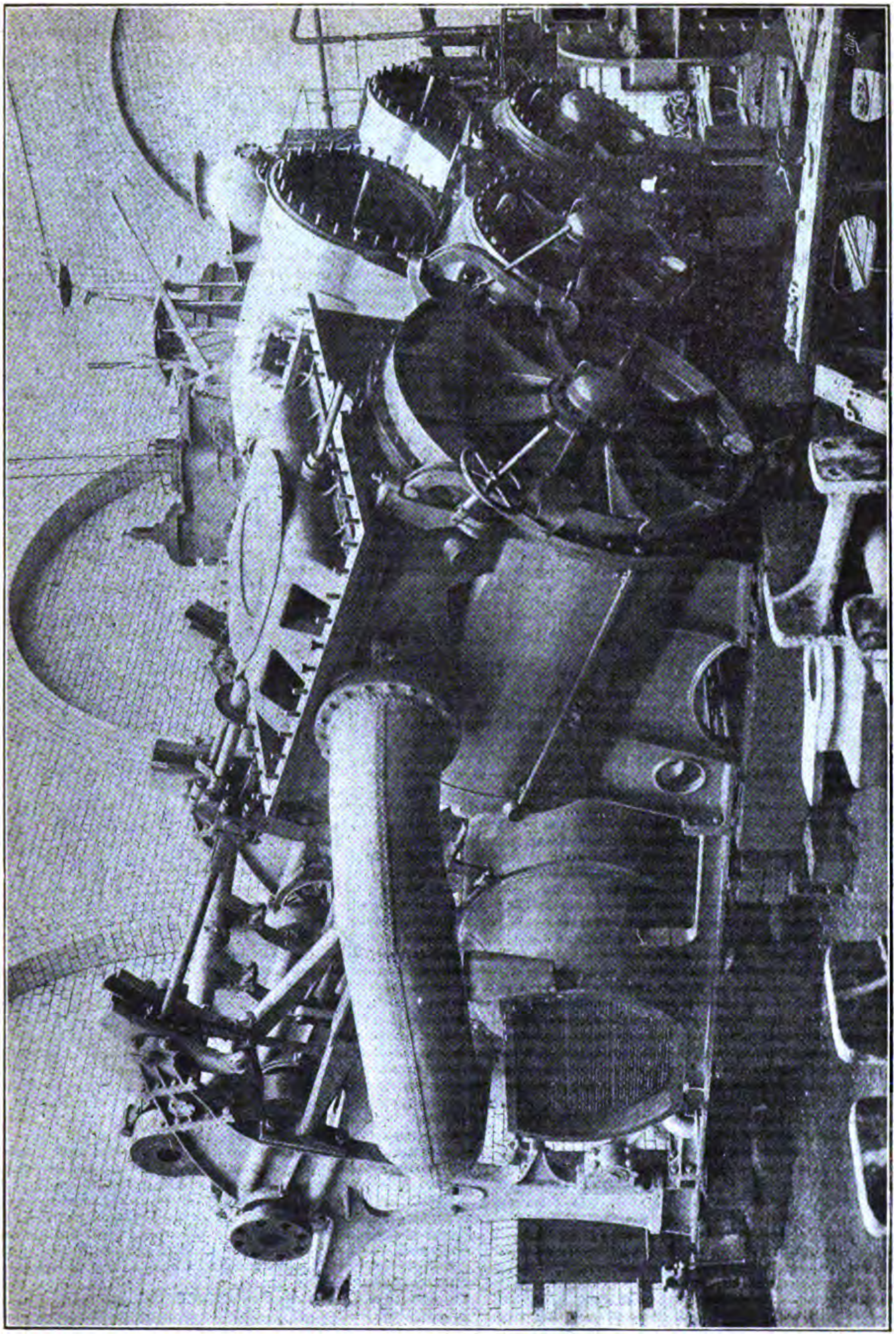
ALTHOUGH the Bazin Roller boat has been what we should consider a long time building and completing for sea, we are not to be allowed to suppose that the undertaking is abandoned, or that the inventor and those interested in the novel undertaking have in any way lost faith in the coming success of their enterprise or in their hopes that the vessel will develop at least double the speed of an ordinary steamer of similar displacement and engine power. We had pleasure in hearing the latest details of the progress of this enterprise set forth by Mons. Emile Gautier, on behalf of the inventor, in a paper read on January 20th, before the Society of Arts, a society which has always given encouragement to the ventilation of all novel and scientific enterprises from whatever source they may come. The reader of the paper somewhat disarmed criticism by stating that he was neither a savant nor an engineer, but merely a journalist, who, however, has somewhat signalised himself and his journal by a speciality in the popularisation of scientific questions. Under this head we consider his paper to have been an undoubted success in giving a graphic and interesting account of the Roller boat, its progress, and the hopes that are based upon its completion. The boat now built and being equipped at Rouen, the *Ernest Bazin* by name, has a displacement of 280 tons, with length of 131 ft. 3 in., beam 38 ft. $8\frac{5}{10}$ in., and is mounted upon 3 pair of roller discs of 32 ft. 10 in. diameter, with a thickness of 11 ft. $9\frac{1}{2}$ in. at the hub, hollow and divided into watertight compartments, and which, to give the necessary displacement, sink about one-third of their diameter into the water, that is, have a draught of 10 ft. $11\frac{1}{8}$ in. The engines, boilers, cargo, coal-bunkers, cabins for passengers and crew are all placed upon or under a wide platform mounted upon the axles of these discs. Interesting particulars were given of the first experiments and deductions made by the inventor that the method of progress over the surface of water with a given displacement was most effectually accomplished by the horizontal propulsion of a disc, partially immersed in water, which at the same time was rotated at a speed so exactly proportioned to that of the forward propulsion that the disc should, as it were, tread the water down in its onward course rather than force its way through it, the contact between the extreme periphery of the disc and the water being thus as nearly as possible a rolling contact. This is a very pretty theory and intelligible to all, and the author therefore concludes that water friction in such a roller boat may be regarded as a "quantité négligéable." Were this the case and no other drawbacks consequent upon this form of construction, it would appear to be indubitable that an enormous speed could be attained with little propulsive effort, but we cannot go so far as to admit the elimination of water friction. The sides of the discs, though they have no forward movement relatively to the water over which they are rolling, must by their immersion have a descending movement at the forward portion of their side faces and an ascending movement at their rear faces, and, as the sum of the immersed volumes of the discs must be equal to the volume of the immersed portion of the hull of an ordinary vessel to give the same displacement, and by their division into six distinct hulls must have a greater surface immersed area than that of an ordinary hull, we doubt whether the skin water friction of the sides of the discs will not be as great as that of an ordinary hull, and will, of course, increase in proportion to the velocity of the rotation of the discs, which is a measure of the speed of the vessel. In fact, their action reminds us of that of a disc churn, in which the friction of the disc upon the cream is relied upon, and very successfully, to make the butter. Assuming, however, that the hopes of the inventor are realized, that the water skin friction of immersion is reduced to a very small amount as compared to the ordinary cleaving friction, it appears to us that no regard has been paid to the necessary introduction of solid axle friction, following the support of the whole burden of the ship upon 18 or more axle bearings upon the 8½ in. shafts of the six discs. Such axle friction we know in the case of rolling stock of the most perfected design to represent about 9 lbs. tractive effort per ton of superior incumbent load, and as the *Bazin* is said to be of 280 tons displacement, some of which, however, is represented by the discs themselves, it would appear to us that there is a tractive effort to be obtained from the engines of some 1,800 lbs. to merely overcome the frictional resistance of the disc bearings, which at any rate is a new resistance in substitution of the ordinary skin water friction, which, it is hoped, has been eliminated. However, it cannot be denied that the new Roller boat offers an entirely new problem to the naval architect and marine engineer, and that we shall thus be all extremely interested as to the results of her trials.

S.S. "CALAIS."

In our issue of August last we gave a full-page plate of the paddle steamer *Calais*, which was built by Messrs. William Denny & Brothers, and engined by Messrs. Denny & Co., of Dumbarton, for the London, Chatham & Dover Railway Co., for their cross-channel service between Dover and Calais, and in this number we have pleasure in presenting to our readers an illustration of the engines as they appeared in the erecting shop of the builders. As will be seen from the illustration, they consist of one set of triple-expansion diagonal engines, which are supplied with steam by four tubular boilers, at a working pressure of 150 lbs. per square inch. The cylinders have cast-steel pistons and forged-steel piston rods. The high and intermediate pressure cylinders are fitted with piston valves, while the valve on the low-pressure cylinder is of the usual double-ported type, with an equilibrium ring on the back. The connecting rods, caps, and bolts are of ingot steel, and the crank pin brasses are lined with white metal. The valve-gear is of Mr. Brock's special design, with cast-steel rocking quadrant, arranged so as to keep the lead constant for all grades of expansion. All the shafting is of ingot steel. The engines are controlled by Brown's patent combined steam and hand-reversing gear, and the steam is regulated by a large double-beat valve, worked by screw and lever gear worked from the starting platform. The paddle-wheels are fitted with steel feathering floats, and are of great strength. Two independent centrifugal pumps are fitted for circulating purposes, and are capable of drawing water from the bilges if required. The feed pumps consist of a pair of Weir's direct-acting pumps, discharging through a feed filter. The boilers are of steel, with Fox's corrugated furnaces and iron tubes. They are worked by forced draught on the closed-stokehole principle, air being supplied by two fans. The base of the funnel is fitted with Denny & Brace's patent apparatus for catching the sparks and ashes, which are a source of annoyance and discomfort in most steamers having a forced draught.

"Clutha Composition."—Messrs. The Glasgow Patents Co., Limited, inform us that their Clutha Composition, which they supply for ships' holds, is absolutely safe to store in any part of a ship, there being no volatile spirit of any kind used in its manufacture.

Refrigerating Plant.—The trade in ice-making and refrigerating machinery continues to make rapid progress, and during the past year nearly 300 machines on the Linde system alone have been sold. This brings the total deliveries of these up to about 2,900 machines, representing a refrigerating power equal to that produced by the melting of about 24,000,000 tons of ice yearly. Of these installations, about 300 are afloat, all large liners, war ships, and yachts being fitted therewith as a necessary part of their equipment. On land their use constantly expands in every part of the world, and never before so rapidly as at present. Some of the plants now in course of erection are upon a very extensive scale, as, for instance, one for the Bristol Corporation, and another for the Scottish Cold Storage Co.



TRIPLE-EXPANSION DIAGONAL ENGINES OF THE S.S. "CALAIS," CONSTRUCTED BY MESSRS. DENNY & CO., DUMBARTON.

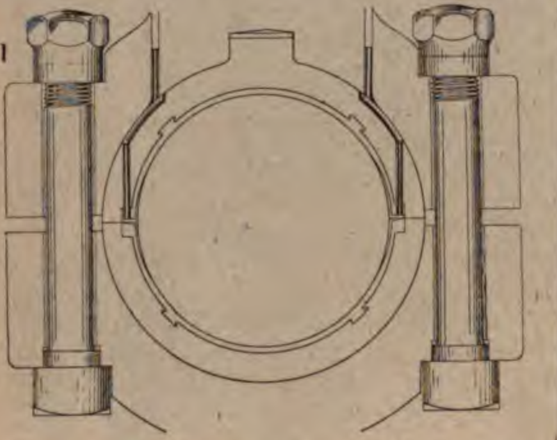
THE BEARINGS OF THE MARINE ENGINE.*

By JOHN DEWRANCE (Member).

THE first object of this paper is to lay before the members an explanation of the way that oil enables a bearing to support its load and afterwards to deal with the modifications in the design of the bearings of the marine engine that follow from a right understanding of the principle of lubrication.

To simplify the explanation, the author has constructed a hand machine. The wheel, 24 in. diameter, represents a shaft, and the bearing may be said to have been flattened out into a plate. If the plate is laid upon the wheel and the micrometer adjusted, the hand will be observed to stand at a given mark. If oil is now put into the trough, so that it touches the wheel, it will be observed that the hand of the micrometer has moved, showing that the plate has risen. This means that between the surface of the wheel and the bearing there is a layer of oil on which the bearing is floating. If now we load the bearing we must either squeeze out this layer of oil or the oil must be subject to a pressure sufficient to support the extra load. By means of a hole through the bearing and a pressure gauge, this point can very readily be proved. As will be seen, as the hole is brought to the point of contact between the bearing and the shaft the pressure on the gauge rises to a point that corresponds to the load put upon the bearing. As explained in a paper by the author, printed in the proceedings of the Institute of Civil Engineers, the oil adheres to the surface of the wheel or shaft, and the force of this adhesion is multiplied by the incline formed by the bearing to the shaft. If the hole is put beyond the centre of the shaft the air in the hole adheres to the shaft and is carried round, leaving a vacuum, as shown by the gauge. Under favourable circumstances this vacuum has amounted to 30 in., being within a quarter of an inch of the barometer at the time. The conclusion to be drawn from this experiment is that bearing surfaces that are properly lubricated are separated by a film of oil at a pressure per square inch equal to the load that is upon them.

Nº 1



The realization of this fact suggests the following rule, which can be easily committed to memory, and is applicable to all classes of bearing. Introduce the oil at the points of least pressure and do not provide a means of escape for it at the points of greatest pressure. It is very easy to find out these points of an ordinary bearing that are least subject to pressure, and the oil can generally be brought there with a little scheming. The means of escape most generally met with are oil holes and channels that frequently occur just at the crown of the bearing where the pressure is greatest.

When the pressure on such a bearing is intermittent, the oil goes in when the pressure is taken off and escapes out again when the pressure comes on, the effect being that the bearing is only able to support a proportion of the load that it could support if lubricated according to the rule. It is quite impossible to lubricate such a bearing at all if subjected to a continuous load. Not a drop of oil will run down the hole at the crown of the bearing, and if the oil is put on the shaft elsewhere it runs out at the hole at the crown.

The diagrams, which we give, represent the principal bearings of the marine engine to which this rule has been applied. No. 1 is the big end of the connecting rod of a vertical inverted marine engine. In this case the two sides are the points of least pressure, and, as will be seen, the oil is led to chambers at the sides. From these chambers suitable inclined planes are provided, and the oil will arrive at the surfaces which have to bear the load at a pressure per square inch equal to the load. It will be noticed that in each case the means of lubrication are in duplicate. This, in the case of large bearings, is strongly recommended, as otherwise one-half of the bearing is only lubricated by the oil that has passed through the other half, and in very large bearings this is not always found to be sufficient, especially when the bearings are new. The double supply of oil is also a great safeguard against failure.

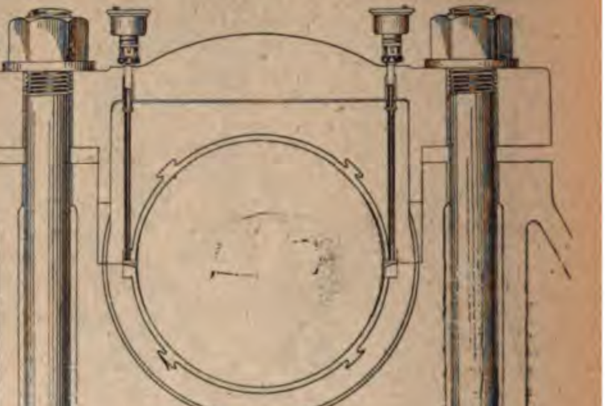
Diagram No. 2 represents the crank shaft bearings. The duty of these bearings is almost identical with that of the big end of the connecting rod. As will be seen, the lubrication is also the same. It seems to be very generally the custom to make these bearings hexagonal or square on the outside. Such a bearing is very difficult to get out to examine or scrape up. The bearing shown is circular, and is prevented from turning with the shaft by a square part on the top half. Such a bearing can be taken out very readily.

Diagram No. 3 represents the little end of the connecting rod. Here again the oil requires to be delivered to the sides the same as to the big end. The diagram shows the oil conducted through the pin. At the end there is a swivel joint. One of the pipes shown brings the oil for the little end and delivers it through the pin; the other pipe brings the oil for the big end and delivers it on the other side into a chamber from which it is conducted by two pipes to both sides of the big end.

Diagram No. 4 shows the general arrangement of these pipes from the lubricators to the bearings.

Diagram No. 5 shows the thrust block. It is strongly recommended that the cooling water should be kept away from the oil, as the mixture of water and oil is an inferior lubricant to pure oil. As will be seen, chambers are formed in the casting through which water can be circulated. There is a difficulty about this form of bearing, in that there is no point of least pressure at which to introduce the oil, so it is necessary to make one. To accomplish this the edges are sloped off as shown on diagram No. 6. With inclined planes such as are shown, it is possible to draw the oil in between the surfaces up to any pressure.

Nº 2



If once we accept the principle set out in this paper it follows of necessity that a hot bearing is due to a failure of lubrication. If the oil is supplied, as shown by the diagrams, this may be due to the fact that the shaft is not round, is not running true, or else, that it is not smooth enough. Shafts should be finished by clamps lined with emery cloth till they are well polished. Another cause may be that the bearings are not properly fitted. It is no light task to surface up a bearing so that the shaft beds thoroughly.

Having dealt with the subject of the means of lubrication, the next point is the oil. In these days of competition and lowest tender, very inferior oils are sometimes used in very superior ships. Adulteration of oils is so general that the names by which they used to be known has no longer any real meaning. Whenever it is possible it is the safest way to have the samples of oil examined and reported upon by a chemist, who also has the means of testing the lubricating properties.

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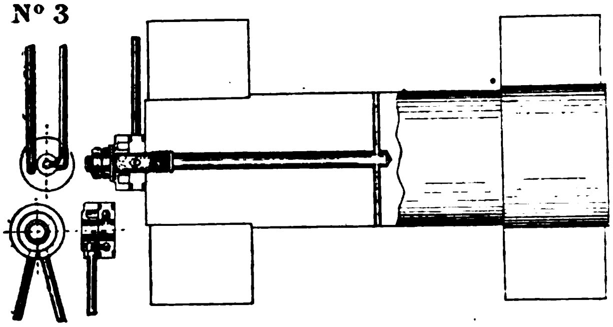
* Paper read before the Institution of Marine Engineers.

Another very important point is the material of which the bearing is composed. Marine engineers seem to be very generally agreed that the bearing should be lined with one of the alloys known as the white metals. These may be divided into three classes. The first contains anything up to 80 per cent. of tin, the second anything up to 80 per cent. of zinc, and the third anything up to 80 per cent. of lead. If we could make sure of always using perfectly neutral oil there would be very little to choose between these three classes, but in order to obtain a neutral oil, such as is prepared for clockmakers, the oil is agitated with zinc and lead shavings, a portion of each is converted into zinc or lead soap, which is afterwards separated from the oil. The principal impurity of lubricating oils is oleic acid, which rapidly corrodes lead and zinc. The plates shown are examples of this. The effect then of using an alloy that contains a large proportion of lead or zinc is that the impurities of the oil combine with the surface of the bearing. Of course this may be avoided by using a very pure oil, but those that are responsible for the lining of the bearing are not always responsible for the quality of oil used, and even if they are at the time they cannot make sure that they will always have it under their control. Tin is not affected by oleic acid or any of the impurities of oil, so the safest way is to use an alloy composed principally of tin, and only containing enough of the most suitable metals to harden it to the utmost. Many of the alloys at present used are too soft and yield with a load of even as little as a quarter of a ton to the inch. Such a metal is liable to squeeze out in use. An all-round lining metal ought to stand at least five tons to the square inch without any yield, the best alloys will stand eight tons.

It is a very general custom among marine engineers to hammer the alloy after the bearing is lined. If the alloy is as hard as is desirable it cannot be very ductile, and this hammering cracks it in all directions; if, on the other hand, the alloy is ductile enough to stand hammering, it is conclusive proof that it has too low a compression test to be suitable for lining marine bearings. The author feels considerable diffidence in appearing to lay down the law to those who have had so much more experience of marine bearings. It is, however, right to say that the points dealt with are no untried ideas, but are the result of many years of study on the subject, and a very long series of experiments. It would take too long to even outline these experiments, but they entirely confirm the facts laid before you in this paper.

N° 3

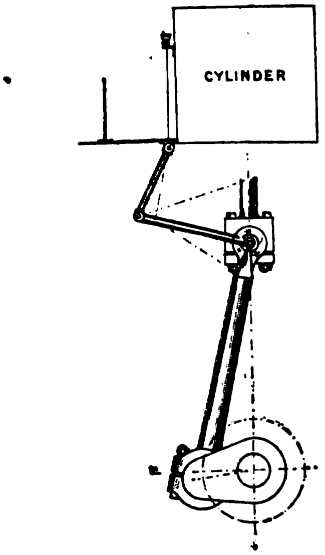


SECTIONAL PLAN

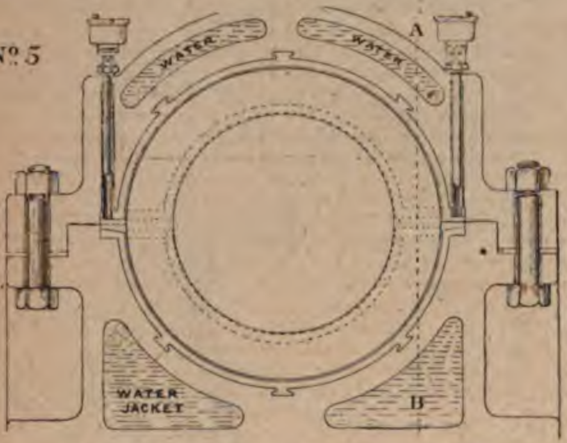
In the course of a discussion which followed the reading of the paper,

Mr. Fortescue Flannery, M.P., said he was very sorry that owing to his inability to be present at the opening of the meeting he had not heard the whole of the paper, but so far as he had been able to follow it he understood that this machine, shown by the author, had for its object the demonstration of the wedging action of the oil when carried around by the surface of the shaft—in other words, that there must necessarily be friction between the oil that was placed in the bearing and the skin of the shafting, so that as the shaft revolved it tended to carry round the oil with it, and that formed, as it were, a film of oil wedged between the surface of the shaft and the bearing that was about it. Mr. Dewrance had demonstrated to them what might be shown by a model scientifically conceived and ingeniously constructed. It showed clearly to them, in common parlance, that the point of greatest pressure in a bearing was that point in line with the axis of the cylinder, because as the crank came upwards the bottom of the crank pin and the top of the bearing were necessarily subject to the greatest pressure, and similarly on the down stroke the top of the crank pin and the bottom of the bearing were subject to the greatest pressure. Mr. Dewrance had shown very clearly that if he was right they had hitherto been all wrong. He (Mr. Flannery) was not prepared to say at the moment that there was not something that might be urged against the lecturer's view. He confessed it was a view that was entirely novel to him, and it was extremely interesting, but on the spur of the moment one was not willing to commit oneself to a new demonstration, however accurate and interesting it may appear to be. But Mr. Dewrance had made out a very strong case, and as far as he (Mr. Flannery) could judge at the moment it was a case that was quite unimpeachable. He had shown them that they should introduce the oil at the point of least pressure in a bearing. Hitherto they had always been in the habit of introducing the oil at the top of the bearing, and that was clearly demonstrated by this model, and by the arguments of the lecturer, to be the point of greatest pressure on the up stroke, as the bottom was the point of greatest pressure on the down stroke. He could not help thinking that the system which had been explained to them that evening was one that should be given a fair trial. Mr. Dewrance had not referred to any instance of a practical trial of his system in competition with the ordinary bearings, but personally he (Mr. Flannery) should be only too glad to give this system a fair trial in the hands of one of his people who would do justice to it. He thought the matter of sufficient importance to deserve being dealt with at the earliest possible date. Mr. Dewrance had referred to the difference between square bottom, or hexagonal, and round bottom bearings. In modern practice the system of making the bottom brasses round at the bottom, so that it might be lifted out without lifting the shaft, had become very general, and although that system had some disadvantages, he thought that on the whole the balance of advantages was in favour of the round bottom bearings. There was, for instance, the disadvantage of not being able to line up quite so quickly as in the case of square bottom bearings, but so far as his personal experience went he thought that round bottom bearings offered the greatest advantages, and, generally speaking, he was giving them the preference. With regard to the diagram showing the arrangement proposed by the author for leading the oil pipes from the lubricators to the ends of the connecting rod, it occurred to him that there might be some objection to those long series of pipes

N° 4



No. 5



and joints. There was always a possibility of the oil clogging and the danger was that when once they got a pipe clogged they might find the bearing heated before they had a suspicion that anything was wrong. Even the model shown that evening had not worked quite as was expected, owing, as the author suggested, to clogging. He heartily endorsed what Mr. Dewrance had said about the quality of the oil, and when he (Mr. Flannery) told them that some oil was sold and bought at 3s. per gallon, while there were plenty of people who would offer them oil at 1s. 1½d., they would see that there must be something wrong somewhere. He could not say quite what it was that was wrong, but he did know that if they held some of this oil up to the light it had that bluish tint which was so suspicious of petroleum and adulteration. He knew of instances where great damage had been done through the use of this inferior oil, amounting in some cases to hundreds of pounds, and he therefore heartily endorsed the recommendation that oil should be most carefully selected and tested. The author had not mentioned in his paper the melting-point of the alloys referred to. This was a very important matter, and it would be valuable information for the practical men present if the author would tell them something about the melting-points and the character of these three alloys of tin, lead, and zinc. The desideratum in white metal was to obtain such an alloy as would be sufficiently stiff to stand the pressure and the hammering, and not run in the event of the bearing getting too hot. He would suggest that the author might also give them some indication of his ideas as to the advantages of strips of white metal as compared with slabs. Some makers made their white metal in the form of strips two inches wide, which were alternated with brass or cast steel about an inch and a quarter wide. But other makers gave only strips of the brass or cast steel, and then on each side of that strip there extended for several inches a large slab of white metal. One of those practices was probably better than the other, but which he was not prepared to say, and they would, he thought, be glad of any information the author could give them on the point. The advantage of having alternations of white metal and either steel or brass—whichever might be the face of the bearing—were very great—arising from the different wearing powers of the two metals. He remembered some 25 years ago, when the White Star steamers first came out and were the observed of all observers on the Mersey, that they had great difficulty with their bearings. Really the one thing which, simple as it appeared, made all the difference between the success of that line in its first stages and comparative failure was that the bearings gave so much trouble on the first few voyages. Well, about this time his friend, who for many years occupied the position of superintending engineer to the White Star Co., came over from Belfast. He lifted all the shafts, took out all the bearings, and drilled holes about a quarter of an inch deep, and an inch and a quarter in diameter; he then filled these holes up with white metal. These holes were placed, not in a line, but zigzag round the bearing. The white metal studs were made perfectly true to a bearing with the shaft, and after a while the white metal, being softer than the brass, wore almost imperceptibly, and these small holes, arising from the greater softness of the white metal, formed little recesses for the oil, and as the shaft revolved over the comparative ridges of the brass it carried some of the oil round with it. These bearings gave little or no trouble afterwards, and the difficulty which, small as it was made, as he had said, all the difference between success and failure, was absolutely and satisfactorily overcome.

Mr. J. H. Thomson said that in a paper that was recently read before the Institute, Mr. Munro Ross advocated the same principle in lubrication that was now brought forward by Mr. Dewrance. He did not know that they followed Mr. Ross exactly at that time, but now that the matter had been further explained to them he thought they could clearly understand the advantages that were claimed for this system. He was sure that they all felt extremely indebted to Mr. Dewrance for the manner in which he had brought the subject before them.

Mr. J. T. Smith criticised several features of the system advocated by Mr. Dewrance.

Mr. J. G. Hawthorn said that to a certain extent the paper just read revolutionised the whole of our marine practice in connection with lubrication. When running at sea they put in the oil at the top of a bearing, and they felt that the bearing was getting the oil, but after seeing the working of the model shown by the author they must all agree that they could not have had anything which would have better demonstrated that the best place to put in the oil was at the side of the bearing. He would ask Mr. Dewrance, however, if he could not give the meeting some information as to the limit of pressure between the two surfaces when the oil would retain its viscosity. They had read a great deal as to the pressure that oil would stand, but he thought that the experiments hitherto, had been conducted in connection with sliding friction. They were told that some oil would stand pressure up to 500 lbs. per square inch, and that might be so between flat surfaces, but he did not think that the same result would be obtained in a round bearing. Had Mr. Dewrance made any experiments to bring out the limit of pressure when the friction between the shaft and the bearing would overcome the viscosity of the oil? Because if this system would allow them to run their bearings tighter with safety, so that they might get rid of that thumping noise which was frequently so troublesome, then Mr. Dewrance's system of lubrication would be a great benefit to the engineering profession.

Mr. Leslie explained his reasons for doubting the advantages to be obtained from Mr. Dewrance's in practical working as compared with the present method.

The discussion was continued by Mr. Shorey, Mr. White, Mr. John Adamson, and others.

The chairman said that before the meeting closed he should like to say how much they all appreciated and valued the remarks of Mr. Flannery, who put the matter before them in a way that greatly helped the subsequent discussion. With regard to the interesting incident mentioned by Mr. Flannery as to the use of white metal plugs, he, Mr. Durston, remembered that a good many years ago some of the engineers in the Navy thought the same thing, and in one ship the plan was tried with success. But these plugs were also put in the bearings in another ship, and they turned round on their centres; and with round plugs it seemed to him there must be this liability. Had the holes been oval it would not have occurred. He mentioned his experience in this connection because he thought it should be known to the meeting. Mr. Dewrance's suggestion was a very interesting one, and if the plan proved satisfactory in actual working it would enable them, as Mr. Hawthorn had said, to carry their bearings much more nearly adjusted and so reduce the hammering action.

Mr. Dewrance, in reply, thanked Mr. Flannery for his kind offer to make a thorough trial of the system of lubrication recommended in the paper. The melting points of the white metals varied slightly according to their composition, but it might be taken that those composed principally of tin become plastic and useless at a few degrees below 500 deg. Fahr. The alloys composed principally of lead would stand a few degrees above 500 deg. Fahr., and those composed principally of zinc stood nearly 600 deg. Fahr. It must be remembered that when the temperature rose above 200 deg. Fahr. the viscosity of the oil was so greatly reduced that it did not lubricate the bearings properly, and there was very little chance of the bearing running well until it had been cooled down. It was very bad for the white metal to run out from a bearing, but it was worse to have the shaft damaged by a bronze bearing. His experience had been that bearings lined in strips were not so serviceable as those that had the surface entirely covered. With properly lubricated bearings the question as to which metal wore the best did not arise in the ordinary sense. The surfaces were separated by a film of oil, and were only affected by the chemical corrosion caused by the impurities in the oil. The limit of pressure that the film of oil would sustain was very high in some of the experiments; the surfaces had been separated by such a film at pressures up to 4,000 lbs. per square inch. It was necessary to bore out the bearing larger than the shaft to allow for the expansion of the shaft and for the film of oil, but it was not easy to see what benefit resulted from making more allowance than that. Several members had spoken of the advantages of plenty of surface in the bearings, but if bearings could be lubricated in a way that enabled them to bear increased loads with safety it would economise weight, and enable the designers of marine engines to get more power into a given space.

It was agreed that the discussion on the paper should be adjourned until Monday, January 11th, and a vote of thanks to Mr. Dewrance, proposed by Mr. Ruthven, and seconded by Mr. Thomson, was unanimously adopted.

A vote of thanks to the chairman, proposed by Mr. Flannery, and seconded by Mr. Leslie, was carried by acclamation.

A meeting of the Institute of Marine Engineers was held on January 11th at the Institute premises, 58, Romford Road, Stratford, when the discussion was continued.

Mr. J. T. Smith reopened the discussion on the subject, and referring to the white metals generally employed for lining engine bearings, said they were not so much concerned with the wearing of the white metal as with the decay that took place. There was a very great difference between the various alloys of white metals, and reference had been made to the information given in text-books on the subject, but it was clear that they wanted something more than text-books to guide them. He had taken out the particulars of three different white metals. The first was composed of 1 per cent. of copper, 68 per cent. of tin, 30·5 per cent. of zinc, and ·5 per cent. of lead. The second consisted of 8·5 per cent. of copper, 83 per cent. of tin, and 8·5 per cent. of antimony. The third sample was composed of 4·4 per cent. of copper, 16·6 per cent. of tin, and 79 per cent. of zinc. Now it would be very interesting if Mr. Dewrance would tell them which of these three specimens of white metal he would recommend. Mr. Smith then called attention to two pieces of metal, apparently much decayed or corroded, and said that both had been in use for nine years, one in a crank pin and the other in a guide shoe. The metal had proved a very good wearing material, and the piece taken from the guide shoe was found to be more decayed at the back, away from the rubbing surface, than at the front. Some strips of this same metal were put in oil, and some in sea water and oil mixed. The oil used was a very high class oil—a compound—with a good body, and it mixed very well with fresh water. The shaft that was run with this oil was bright and polished; the oil did not attack it. With regard to the metal put in the oil they did not find that it was affected during a period of two years. At the end of that period it remained just the same as at the beginning, so that there was evidently something wanting to cause the decay to continue. Perhaps it was the absence of heat that made the difference. Neither had the metal in oil and sea-water perceptibly altered. Both samples were suspended in vessels open to the atmosphere. With regard to the lubrication of the cross-head by Mr. Dewrance's method, he (Mr. Smith) had not yet been able to learn how the oil would rise from the side to the crown of the cross-head.

Mr. Dewrance said that he had had experience with a horizontal engine, where the cross-head was perfectly lubricated, and the oil was admitted at the bottom.

The Chairman said that with regard to cross-heads his experience had been that white metal did not answer so well for a swinging movement, and this possibly was because the lubrication was not perfect. In all the white metal lined top ends that he had seen the swinging motion tended to cut the white metal very badly. He did not think that there were many engines of the smaller sizes which had white metal in the top ends.

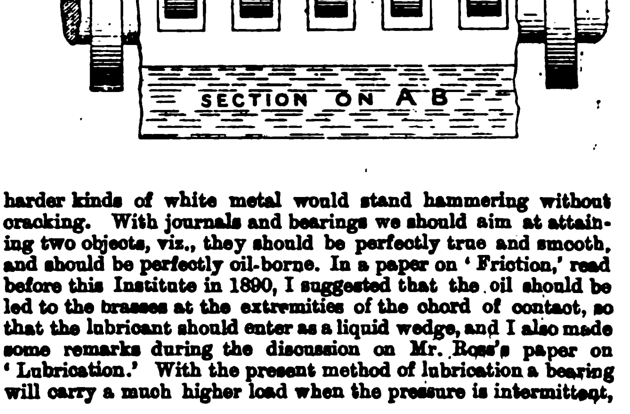
Mr. Smith said he could not agree with the opinion expressed by the chairman that white metal was not suitable for a reciprocating motion, as he had found it work well in beam links. He believed that it was the heat in the cross-head, and not the swinging motion, that caused white metal to work badly in cross-heads.

Mr. Dewrance said that if they used a white metal composed of zinc or lead it was absolutely impossible to run it in a cross-head, but if they had a metal sufficiently hard his experience was that it would run better than brass. In such a bearing they must have a white metal capable of resisting a pressure of several tons per square inch without yielding.

Mr. James Adamson (the honorary secretary) read a communication that had been received from Mr. W. J. Nowers Brett, who wrote:—

"I had great pleasure in listening to Mr. Dewrance's paper read before the Institute. He has clearly and most ably placed before us a system for the proper lubrication of bearings, a most important consideration in the efficient working of machinery of every description, and doubly so when placed inside the hull of a ship. Marine engineers have been rather conservative when dealing with lubrication of bearings, mainly due, I think, to the fact that the principles of lubrication and friction have not been thoroughly understood. Mr. Dewrance, and I am sure all engineers, will agree with me in saying that great credit is due to Mr. Beauchamp Tower, of the Institution of Mechanical Engineers, for his experiments on friction, but I think Mr. Tower might even have carried his researches further, considering the great importance of the subject. Other gentlemen—Captain Galton, Mr. Westinghouse, and Professors Keening, Jenkin and Kimball—have, by their researches, enlightened us considerably upon this subject. I would also mention that more than once Mr. Macfarlane Gray has given some valuable hints on the subject of lubrication and friction.—I think much remains to be done with regard to the co-efficient of friction of the different kinds of white metal now used by marine engineers. I am inclined to think that the varying proportions of tin, zinc, and lead used must have varying frictional values, and when we find that other metals are added in addition to these I think you will agree with me when I say we should have some fixed standard for white metal, so that we can form some idea of what we are using. At any rate, a better knowledge of the general behaviour of the different kinds of white metal from an experimental point of view would be most valuable to all engineers. With regard to the hammering of white metal, the only way of getting over the difficulty is by heating the bearing before running in the white metal, and so prevent the metal from shrinking too much when cooling, and becoming slack. But it is not always possible or desirable to heat a bearing to any great degree, and the only remedy that I can see is to use a softer metal, and tighten it by hammering. It would be well if we knew to what extent the harder kinds of white metal would stand hammering without cracking. With journals and bearings we should aim at attaining two objects, viz., they should be perfectly true and smooth, and should be perfectly oil-borne. In a paper on 'Friction,' read before this Institute in 1890, I suggested that the oil should be led to the brasses at the extremities of the chord of contact, so that the lubricant should enter as a liquid wedge, and I also made some remarks during the discussion on Mr. Ross's paper on 'Lubrication.' With the present method of lubrication a bearing will carry a much higher load when the pressure is intermittent,

No. 6



and I believe that is almost the only way most bearings receive the oil at all."

Mr. Godfrey Elliott said that one of the principles upon which he believed most marine engineers insisted was that it was necessary to air the bearings—that they should get plenty of air between the surfaces. Of course Mr. Dewrance's system was entirely against that principle. In his method there was no means of getting air into the bearing or circulating air between the surfaces. Then, again, marine engineers, in designing their bearings, very often put strips of white metal, sometimes placed diagonally, and sometimes in a line with the bearing. Mr. Dewrance advocated a bearing of white metal all the way round, and this seemed to him (Mr. Elliott) a very feasible suggestion because, as had been explained, the wear of the bearing was owing to the corrosion of the bearing, and if they got white metal and gun metal alternately, and one corroded more than the other, these strips, instead of assisting lubrication, tended to form scrapers to scrape the oil off the shaft, which was surely detrimental to the good running of the bearing.

Mr. Dewrance said he could not understand how the use of white metal in the form of either strips or studs could prove beneficial, and it could only be so used in those bearings which had such a large excess of surface that they could afford to throw away considerably more than half of it. The pressure would have to be borne either by the strips or plugs of white metal, and if that was the case they were certainly not getting the proper duty out of the bearing. If they wanted to get the maximum duty out of the bearing they must make it all of one uniform composition. By employing strips or studs the two different sorts of metal form a kind of voltaic couple, which favoured the chemical action or corrosion very much indeed. Mr. Brett, in the course of his communication, spoke of the desirability of having standards of co-efficients of friction for the different anti-friction metals in the market. The idea of an anti-friction metal was one that his (the speaker's) father must have started, and it arose, he thought, from an incomplete comprehension of the merits of white metal. There was no such thing as an anti-friction metal. White metal had its advantages, but not in the sense of being an anti-friction metal, because there was no metal that would run without oil or lubrication. The co-efficient of friction of any given bearing surface was exactly the same as the co-efficient of friction of any other surface. The friction was fluid friction due to the film of oil between the surfaces. The co-efficient of friction was the same, whether the surface be of bronze or white metal, or anything else. The advantage of white metal over bronze was that when properly composed it would resist chemical corrosion, and when lubrication failed it did not damage the shaft. With regard to the question asked by Mr. Smith at the commencement of the discussion, his reply was that none of the samples given were good, but the one which contained the most tin and which would bear the heaviest compression test was the best. He had no doubt that the specimens of decayed metal produced by Mr. Smith would prove on examination to contain a very large proportion of zinc. The action of the bearing had decomposed the oil—broken it up into glycerine and oleic acid—and that had caused the corrosion. That was his explanation of the present appearance of the metal, but he would very much like to have an opportunity of verifying his opinion by analysing the metal. Then with regard to the hammering of white metal. He adhered to his opinion that this hammering was not only undesirable but absolutely unnecessary, and he explained a method of lining bearings with white metal which he maintained would completely remove any necessity for hammering. The hammering simply broke up the metal into a kind of mosaic, which gave rise to all sorts of trouble.

Mr. Ruthven said he could see that Mr. Dewrance's system was a valuable idea brought to a practical point, but the question was, how could it be applied to present bearings, which, of course, were not lubricated in this way? How could they improve present lubrication by the light of the knowledge obtained from Mr. Dewrance's experiments? It seemed to him that the provision of an inclined plane was one of the chief points of the system, and he suggested whether they could not make a lot of inclined planes away from the channels in the present bearings. If it was clearly understood that the inclined plane was a chief feature, they might make inclined planes even by deducting from the surfaces. He thought they were very much obliged to Mr. Dewrance for showing what accurate workmanship could do. Working on the principle that they could not prevent friction altogether, he had shown them how to reduce it as much as possible by getting in the oil in this ingenious method.

Mr. Dewrance said there was no doubt they could improve the present bearings by taking off the edges of the channels and making an inclined plane, but the difficulty was that these channels were mostly at the point of greatest pressure. His suggestion was that they should fill up the channels and then make an inclined plane.

Mr. F. Cooper said it had been urged by Mr. Dewrance that pure oil was always a better lubricant than oil and water mixed. A good many of them, however, had found that in thrust bearings a mixture of a certain kind of oil and water gave a better lubrication than the oil alone would give.

Mr. James Adamson said he was very glad that Mr. Dewrance had referred to the paper previously read by Mr. Ross on this subject, and he had been able to give a reason to Mr. Ross for the faith that was in him. Most engineers were agreed that white metal did not suit so well for cross head bearings as for the other parts of the engine. There was an intermittent pressure on the cross head bearings, and perhaps that fact would explain the general unsuitability of white metal for this bearing. The discoloration of the oil suggested another interesting question, for there was a point of discoloration at which it was shown that they were carrying away a part of the white metal, and that suggested the question whether they were using the most suitable class of oil for the particular class of white metal. With a certain kind of white metal the hydro-carbon oils gave the best results.

The discussion was continued by the Chairman, Mr. McLaren, Mr. Kirkwood, and others, and on the suggestion of the chairman, Mr. Dewrance was accorded a hearty vote of thanks for his attendance.

A vote of thanks to the chairman concluded the proceedings.

AUTOMATIC WATERTIGHT DOORS.

A NEW system of watertight doors, with mechanism for automatically closing the same, has been invented by Mr. John Ollis Pelton, of Croydon, to be used in ships' bulkheads, etc., so as to prevent an inrush of water into the side of a ship, in the event of a collision, running on rocks, or damage in action.

In designing the apparatus the inventor had the following requirements in view :—

Firstly.—The door must be automatic.

Secondly.—It must be easily worked by hand.

Thirdly.—Its action must be very rapid.

Fourthly.—The mechanism must be simple and easily accessible.

Referring to the illustrations—Fig. 1 is an elevation of the bulkhead of a ship, showing the opening or entrance and the gearing for closing the doors. Fig. 2 represents an elevation of the gearing for hermetically fastening the doors when closed; Fig. 3 being a sectional view of the wedges which are brought into action for the purpose of hermetically securing the doors.

Similar letters refer to similar parts throughout the several views.

The bulkhead A has in its side the opening or entrance B. Sliding upon the face of this bulkhead are two doors, an upper door C, and a lower door D, which move simultaneously by means of gearing. These doors are so weighted that the upper door is sufficiently heavy when released from its upper position to descend and pull the lower door up to meet it at the middle of the entrance. This upper door C has attached to each of its sides racks E E, each of which gears into toothed wheels F F, revolving on pins attached to the bulkhead plates. Each of these toothed wheels has also gearing into it racks G G, the lower ends of which are continued by bars H H in an oblique direction to the top of the lower sliding door D, to which they are attached. These racks slide in guides J J, J J, fixed to the bulkhead plates. It is obvious that by means of these racks the upper and lower doors must move simultaneously one with the other. Attached to the upper end of the lower door is a hinged projecting lug K, arranged so as to be free to move only in an upward direction, so that when the lower door D is pushed down the lug lifts up when passing the hooks L L, and then drops under them, becoming rigid, thus keeping the lower door secure in its lowest position. The lower door D is thus kept from rising (as it would naturally do owing to the superior weight of the door C), as the hooks L L, are prevented from moving by the springs Z Z, hence the doors will close only when the resistance of these springs has been overcome and the hooks moved aside, when instantly the doors C and D will move respectively up and down until they meet in the middle of the doorway. The machinery is of sufficient strength that this result cannot be produced by any motion of the vessel, however violent; but on the other hand, it can be easily and speedily effected by the following means:—

First, with regard to the automatic operation of the doors.

Underneath the flat of the compartment in the neighbourhood of the door is a watertight chamber enclosing the tank P. Within this chamber are two toothed wheels M M, revolving on pins fixed to frames attached to the bulkhead. These toothed wheels gear one into the other, and each has a lever N N, fixed to its side and extending from the centre of the wheel to a considerable distance beyond, having its outer end bent at right angles to the bulkhead at O O. These levers are placed in an opposite direction to each other and cross each other between the toothed wheels. Suspended between the right angle projecting arms of these levers is an open tank or cistern P, immediately under the compartment flat. This flat Q has an opening R R in it, covered by a fine grating, so that any water entering the compartment immediately falls into the open tank underneath.

S S are two horizontal racks, the teeth on the inner ends being geared into toothed wheels M M, and the teeth at the outer ends on the upper side thereof at T T, being geared into toothed wheels U U. Each of these horizontal racks has attached to its inner end a hooked bar V V, which hooks over the projecting lug K, and holds the doors in open position.

The toothed wheels U U have each a vertical rack W W sliding on the frame attached to the bulkhead, and attached to a horizontal lever X X, centred at Y Y, and held down by the long springs Z Z. These long springs may be substituted by weights if preferred. When the tank or cistern P becomes sufficiently filled with water, the weight of the water depresses the levers N N, by overcoming the resistance of the long springs Z Z, and causes the hooked bars V V to release the hinged lug K on the lower door, when the doors immediately and automatically close in the manner hereinbefore mentioned.

It is apparent that a comparatively small quantity

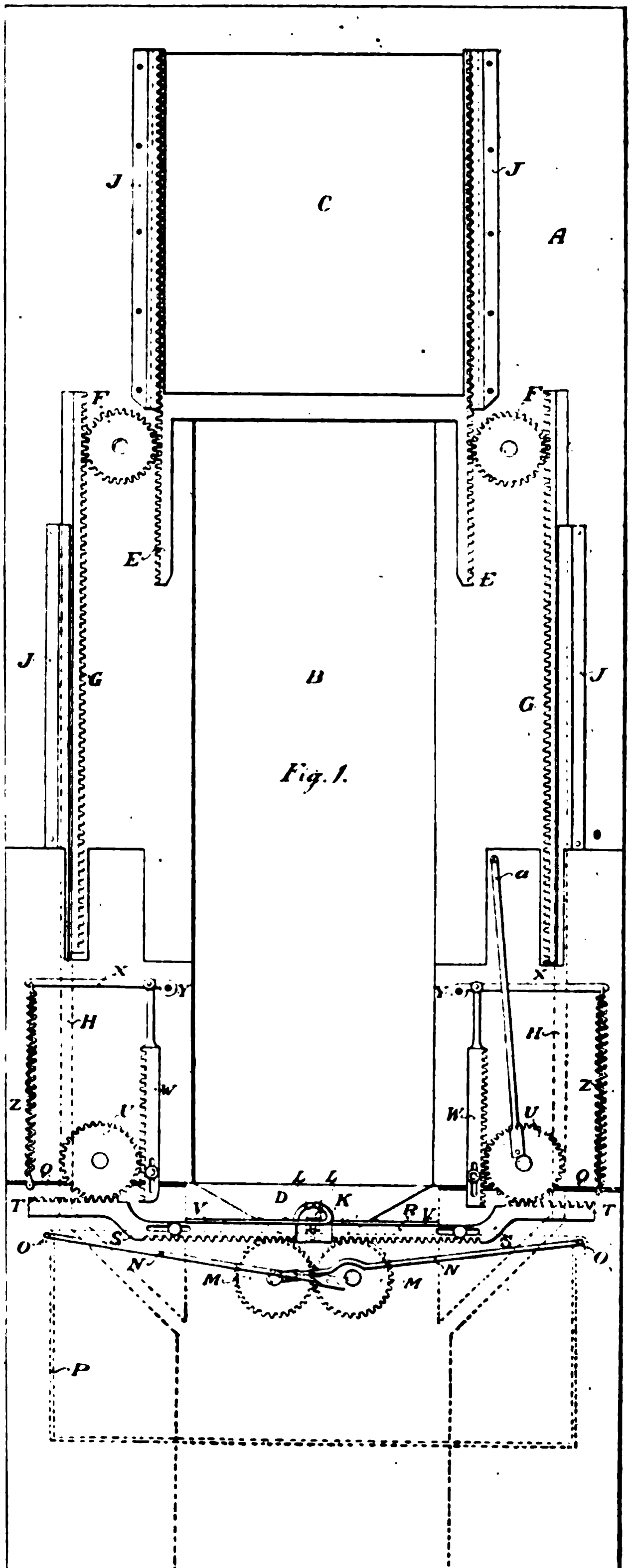


Fig. 1.

of water can effect this result, for the only force to overcome is the resistance of the springs. The dimensions of the tank as shown would be about 42 in. by 6 in. by 16 in., holding approximately 150 lbs. of water. It is considered essential, however, that the automatic mechanism should be so adjusted that it may work when the tank is half full (or less), this would bring a weight of 37½ lbs. to bear on the end of each of the levers N N, which is estimated as being much more than sufficient to effect the purpose. For operation by hand power, the following mechanism is arranged.

a represents a hand-lever fixed to either one or both of the toothed wheels U U, by means of which the doors can be closed by hand, from the compartment flats independently of the action of the suspended tank.

In Fig 2 is shown an arrangement for closing the doors from the deck by means of a handle *b* and screw *c*, working in a nut *d*. Attached to the lower end of the screw *c* is a horizontal bar *e*, with a long vertical attachment bar *f*, having a cam end at *g*. When on turning the screw *c* this *f* bar is lowered, it comes into contact with the forked lever *h*, which embraces a lever *j* attached to the toothed wheel U (in Fig. 1), and thus actuates the gearing and releases the doors in the same way as the hand-lever *a*.

The tightening of the door to make it absolutely watertight, is arranged to be operated *either at the door, or from the deck.*

(The inventor thinks, however, that the leakage, presuming the door to be closed without being tightened, could be easily controlled by the steam pumps).

The tightening is effected by means of vertical racks *k k*, each of which acts simultaneously by means of toothed wheels *l l*. The racks are actuated by a toothed pinion *m*, to which is attached a segment rack *n*, having a pinion *o* and handle *p*. The under sides of each of the racks *k k* are provided with wedged pieces shown at *q q* (Fig. 3), so that when the racks descend the wedge pieces grip wedges on the hinged frames *r r* (Fig. 3), which frames are placed in the side frames of the automatic doors, and thus the doors are wedged in their places when closed. Strips of indiarubber or other suitable material, may, if necessary, be fixed on the inner edges of the hinged frames at *s s*.

The handles *p*, may be placed on either or both sides of the bulkhead, so that the doors may be tightened either inside or outside the compartment. (See wheels *o* and handles *p* in Figs. 1 and 2.)

The doors may be sealed from the upper deck by turning the handle *b* and screw *c* still further, until the horizontal bar *e* comes down to and bears upon the top of the rack frame, as shown at *t*, and continuing, forces the racks down until the doors are sealed.

By any ordinary arrangement of electric apparatus, the fact of the watertight doors being closed may be communicated by the ringing of an electric bell on the upper deck or any other convenient place. This ringing continues as long as the door is closed *without* being tightened. Immediately the tightening is completed, the electric circuit is broken, and the ringing ceases.

The mechanism is so arranged that, even if it is actuated, the doors cannot close while anybody is passing through, thus avoiding the risk of the upper door descending on the head.

For the purpose of facilitating repairs, cleaning, etc., the doors may be held fast in any position, so that the workman will be exposed to no risk while at work.

It will be seen therefore that the door may be worked in three ways:—(1) *Automatically.* (2) *By hand at the door.* (3) *By hand from the deck.* It may be well to mention that it can, by disconnecting certain parts, be made to operate *only as No.* 1, *only as No.* 2, or *only as No.* 3, or *Nos.* 1 *and* 2 *combined, Nos.* 1 *and* 3 *combined, Nos.* 2 *and* 3 *combined.*

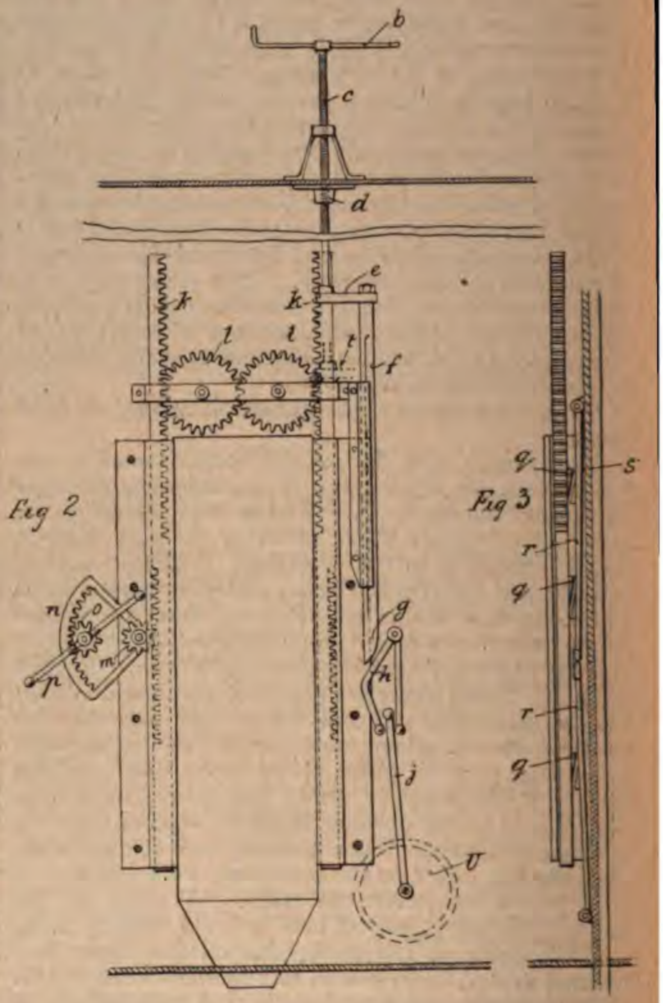


Fig 2

Fig 3

We understand that this invention can be applied to a door moving horizontally instead of vertically.

In situations where coal dust or other dirt might accumulate and interfere with the gear for holding and releasing the door, the gear may in such cases, with slight modifications, be placed above the door, the tank only being beneath.

The invention has been patented in Great Britain, the United States, and the principal European countries.

EFFECTS OF DREDGING.

(From *Natal Mercury*, December 4th, 1896.)

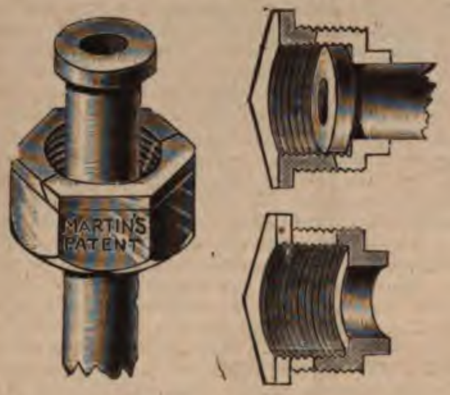
THE rough weather to which our port has been subjected during the past nine weeks has been remarkable, and it would be necessary to go back a good many years before finding a precedent for it. Judging from the experience of the past ten years or so, we have been led to believe that after the month of September we should have not much reason to fear weather of a kind that would seriously interfere with the navigation of the entrance channel until the period of the next equinox, but this year has shown that our confidence has been misplaced, and that the weather we expected to get in August and September has been postponed till October and November. It matters little, however, at what particular time of the year the bad weather comes, so long as we can keep the channel open during that period. In our last article on this subject we described what had been done in this direction up till the 13th October last. Since then there has been little or no improvement in the weather generally, and the struggle to maintain a workable depth of water in the south channel by means of dredging has continued. After five days of incessant bad weather, during which the cone was either at the yard-arm or half-way up, and several vessels were detained in the harbour in consequence of the high seas, it was found on the 14th October that the south channel was completely blocked up. It is true that the central channel gave a depth at low water of 11 ft., but it is not intended that that should be the permanent working channel. As far as navigation was concerned there remained a straight-out channel 17 ft. in depth at high water, and if nothing had been done to prevent it the invariable performance would have been gone through; the channel would have veered round further and further northwards till the deepest depression on the bar—it cannot be called a channel—would have been past the end of the north pier, forming a tortuous route which none of our larger class of steamers would have ventured to take. Under the present system of dredging, however, the *Octopus* was at once set to work to open the south channel so far as the heavy seas would permit. On the 15th, therefore, the dredger attacked the shoal, which was only 5 ft. below low water, and two days later she opened up the channel to a depth of 15 ft. 6 in., which at high water was sufficient to admit a vessel drawing 20 ft. During the next few days the *Octopus* worked intermittently, the seas occasionally driving her away, but in consequence of the large accumulation of sand on the south side of the breakwater, which kept drifting round, it was not found possible to gain a greater depth than from 15 to 16 ft. at low water, which, however, was ample for the requirements of the port, the depths at high water being from 20 to 21 ft. It is scarcely necessary to remind our readers that previous to dredging operations these periods of storms practically closed up the harbour for even moderate-sized steamers for weeks and months after. From the beginning of September, 1892, till the end of August, 1893, there was at no time a depth of 12 ft. across the bar opposite the entrance; the only depths of 12 ft. and upwards were to be found away to the northward of the north pier. During that time there were many periods of fine, calm weather and very high tides, but no force was found sufficient to break through the bar until the little *Beaver* succeeded in scratching a groove through near the breakwater. A still better instance can be given of the efficiency of the dredger to open up a channel in a short space of time. On the 20th October the *Octopus* was again driven off by very heavy weather, the sea outside being exceptionally heavy occasionally, and from the 25th to the 29th the cone was up. On the 30th the *Octopus* got to work on the shoal in the south channel, which was not more than 6 ft. below low water in its shoalest part, and on the following day there was a channel 16 ft. deep at low water; and there are other similar instances of the wonderful effects of dredging. The depth of the south channel has been fairly well maintained to the present moment at an average of about 15 ft., the average depth for the month being somewhat over that. What we learn from this appears to be that with the aid of dredging, the entrance to this port can be kept open, except during boisterous weather—which of course would keep any exposed port closed—after which about 36 hours would be required to open the channel. This is certainly gratifying as far as it goes; it practically means that so far as human agency is concerned we can keep our port open to vessels drawing 17 ft. of water at any time of the year, except occasionally for a couple of days or so after exceptionally rough weather. It must always be remembered that this harbour, like all such exposed ports, must occasionally be closed by reason of rough weather, independently altogether of the depth of water in the entrance channel. During the past trying time there has been comparatively little interference with the egress and ingress of ships on account of want of depth of water; the cause has been chiefly the danger to navigation through heavy cross seas. The average bar depth for the year will come out at about 16 ft., as against 12 ft. 1 in. for last year, and 11 ft. 11 in. for 1894; but the increased average for this year by no means shows the full advantage of the present position. In all previous years the working channel has chiefly been the extreme north channel, which was unfit for large vessels to navigate, but ever since the *Octopus* has been at work the direction of the working channel has been straight out of harbour, except on two or three occasions, when for some reason or other some small craft were taken out by the old north route. Although we are impressed by the splendid work which can evidently be done by dredgers like the *Octopus*, we cannot say that we are satisfied with the depths obtained. During the six months, April to September, the average depth was 17½ ft., which at high water of spring tides gave at least 23 ft. 6 in., and at neaps a little over 20 ft. The average depth for October was only 13 ft. 6½ in., which is disappointing. The weather during that month was exceptionally bad, it is true, but it may be equally bad again, and therefore we must recognise that, unless some improved system is adopted, we may be subjected to a minimum depth of something under 14 ft. We have no fear but that the good depths will be maintained throughout the greater part of the year, and that only for short periods will we be inconvenienced with comparatively shallow depths, but as the strength of a chain is judged by its weakest link, so the credit of the port is judged by its minimum depth. We believe that the experience of the year's dredging will teach those who are responsible a means whereby the accumulation of sand will be checked. It is perfectly well understood that if the sand filling in the bight south of the breakwater could be dealt with, the minimum depths of water on the bar would be considerably raised. The condition of the entrance channel during the past year has been incomparably better than that during any previous year, but the requirements of the port have so enormously increased that what would have satisfied us some years ago is insufficient for the new condition of things, and the success which has attended dredging operations has encouraged us to hope that the capabilities of our harbour will be able to keep pace with the rapid development of trade with this colony.

The *Octopus* was constructed by Messrs. Wm. Simons & Co., Limited, Renfrew.

MARTIN'S PATENT UNION NUT.

THE ordinary union nut has been and still is a very simple and convenient means for the junction of one pipe to another, or to any other device to which it is to be attached, but at the same time there are certain disadvantages which accompany it that cause great inconvenience and loss of time. We refer to the difficulties that are occasioned when the thread becomes stripped or the back of the nut pulled out, or the necessity arises for the renewal of the nut from some other cause; to effect this, the pipe has to be disconnected and taken to the shop, where the collar is cut off, the old nut removed and replaced by a new one, a new collar braized on, and the pipe returned to the ship and re-connected in place. It will be conceded that this simple matter absorbs a considerable amount of time and labour, and any device that will readily reduce such expenditure to an extremely moderate amount will be an immense boon to those who use union nuts.

We have had the opportunity of examining a new union nut, which has been invented by Mr. E. Martin, and it certainly appears to fulfil all the necessary qualifications of an ordinary union nut, and at the same time to be free from the disadvantages referred to above. We illustrate the device in the adjoining diagrams, from which it will be seen that the nut is formed in three parts. In the first place there is an inner nipple which is in two halves, adapted to embrace the pipe, and engage against the back of the collar. The interior of the nipple is provided with the usual thread for connection to the corresponding pipe or device. The nipple is also provided with a thread on its exterior, and is screwed into an outer nut or body, the hole in the back of the latter being large enough to pass over the collar on the pipe. The hexagon sides of the nipple and the body nut exactly coincide when the two are screwed one into the other, so that when complete it appears like, and can be used in a similar manner, to an ordinary nut. It will be obvious from the illustration that an engineer can in a few minutes substitute a worn-out nipple by a new nipple without disconnecting the pipe at all.



These nuts are being put on the market by Messrs. E. Martin & Son, of 68, West India Dock Road, and Robert Street, Limehouse.

SUPERHEATED-STEAM ENGINE TRIALS.

At the ordinary meeting of the Institution of Civil Engineers on Tuesday, January 12th, Mr. John Wolfe Barry, C.B., the President, in the chair, the paper read was on "Superheated-Steam Engine Trials," by Professor William Ripper, M.Inst.C.E.

The author pointed out that the use of superheated steam had been in abeyance for the past thirty years, during which time a continually increasing gain in steam-engine efficiency had followed the development of the multiple-expansion engine, and the increase of steam pressures. The limit having been now nearly reached in this direction, engineers were again reverting to superheating, from which a further considerable increase of efficiency might be looked for. Trials had been carried out on a 17 I.H.P. "Schmidt Motor," a single acting, simple, non-condensing engine, supplied with superheated steam from a Schmidt superheater, to determine the steam consumption of the engine working with various degrees of superheat, and at temperatures considerably beyond those usually employed; and also to find to what extent the dryness-fraction of the steam, and the heat exchange between it and the cylinder-walls, were affected by the superheat.

The heat expended in superheating reduced the amount of heat employed in evaporation of water; but the heat so diverted for the purpose of superheating was shown to be productive of a considerable gain in thermal efficiency. Thus an expenditure of 5, 10 and 15 per cent. of the furnace-heat to superheat gave a net gain of 12, 38 and 70 per cent. respectively of the work done for heat supplied. [30682]

When the load on the engine was fairly constant very little regulation of the superheat was necessary, and the temperature of the superheated steam in the coils remained remarkably steady. If the load on the engine was reduced, the temperature of the steam in the superheater immediately began to fall, though there was no appreciable change in the condition of the fire: on the other hand, if the load was increased, the temperature of superheat increased also. If superheated steam was desired at the engine, then the superheat being once taken up by the steam should have its high temperature preserved by all possible means till it reached the admission-valve of the engine.

It was stated that no important gain could be theoretically expected from superheating, the actual gain in practice being due to the more or less complete removal of the loss by cylinder condensation. When steam was superheated it was in a more stable condition than without superheat, and if the steam contained sufficient excess heat, the steam in the cylinder could be rendered dry at cut-off and at release. This had been accomplished in certain of the trials described in the paper. Superheating thus removed the principal source of loss of heat in the cylinder, namely, water at release, and it reduced also the amount of the heat exchange between the steam and the cylinder-walls to a minimum.

The effect of varying degrees of superheat upon the steam consumption per unit of power was illustrated by a large number of trials under varying conditions. Taking one example, it was shown that steam at 120 lbs. per square inch pressure superheated to 674 deg. Fahr. on entering engine, reduced the steam consumption from 38·5 lbs. without superheat, to 17·05 lbs. per I.H.P. per hour, the rate of decrease of steam consumption with increase of superheat being approximately uniform within certain limits.

It was pointed out from the indicator diagrams how rapidly the superheat disappeared on admission of the steam to the cylinder, and how few were the cases in which the steam in the cylinder was found to be superheated at cut-off, though admitted in a highly superheated condition. It appeared from these experiments that unless the degree of superheat of the steam entering the engine reached at least 200 deg. Fahr. above its normal temperature with a late cut-off, or a still higher degree of superheat for an earlier cut-off, the condition of the steam in the cylinder at cut-off was that of wet steam at the temperature of saturation.

In order that the steam in the cylinder might be superheated during expansion and dry at release, it was necessary that its temperature on entering the engine should be about 300 deg. Fahr. above the temperature normal to its pressure. When the steam was dry at release it was superheated at cut-off from 50 deg. to 100 deg. Fahr., finally falling at end of about three expansions to the temperature of saturated steam. For a small increase in the number of expansions the temperature at cut-off rapidly fell to that of saturated steam.

The author considered superheating not as a means of obtaining a thermal efficiency in any way proportional to the temperatures used, but as a device for realising as far as possible the full thermal efficiency of saturated steam, by rendering the cylinder practically non-conducting. The practical difficulties supposed to be associated with the production and use of superheated steam had been satisfactorily overcome. Experience had shown that with ordinary care as to purity of feed-water, superheater tubes after long periods of severe work showed no signs of burning, scaling, or injury of any kind. With the greatly improved quality of lubricating oils no trouble need arise with the lubrication of superheated steam engines.

The best results could be obtained when the steam was supplied at about 650 deg. Fahr. at the engine. It was important to use good non-conducting material to maintain the high temperature of the steam in its passage to the engine. The best results in these trials had been obtained in association with a high range of pressure in one cylinder with a late cut-off. Any cause which tended to increase initial condensation in the cylinder with saturated steam tended also with superheated steam to absorb the superheat and to neutralize its useful effect in the cylinder. Superheated steam at high temperatures might be safely and advantageously used in double-acting engines. Many such engines were now at work or in course of construction.

The point requiring chief consideration in the design of engines to work with superheated steam was the steam-admission arrangements. The steam-admission valve, being subjected to the maximum temperature, should be practically frictionless, so as to remove the necessity for its lubrication.

The paper was accompanied by an Appendix of Tables giving the results of a large number of trials, and accompanied by diagrams illustrating the effects of superheating on steam consumption, dryness fraction of steam during expansion, heat interchange between the steam and the cylinder walls, work done per lb. of steam, and thermal efficiency.

Magnolia Metal.—The Magnolia Anti-friction Metal Co. of Great Britain, Limited, of 49, Queen Victoria Street, London, and of Manchester and New York, have favoured us with various calendars and a combined foot-rule and straight-edge as seasonable compliments, and which are beautiful specimens as to how these things are got up in America, where they obviously do not lack for taste and artistic design.

SPEAKING TUBES ON BOARD SHIP.

THE importance of means of communication between the bridge and the engine-room of an efficient and reliable character, is a matter which concerns not only ships of H.M. Navy, but those of the Mercantile Marine as well. The various systems of mechanical telegraphs which have been tried, and many of which have proved to be quite reliable under ordinary circumstances, have been known to fail in times of difficulty and danger, and such failure has in some cases resulted in serious consequences. The old-fashioned speaking tube is now little or no use, firstly on account of the distance between the two stations, and secondly by reason of the much greater noise that exists in the large and powerful steamers of the present day. It is not too much to say that an order given to the engine-room from the bridge through an ordinary speaking tube on one of our large ocean liners is quite unintelligible to those to whom it is given.

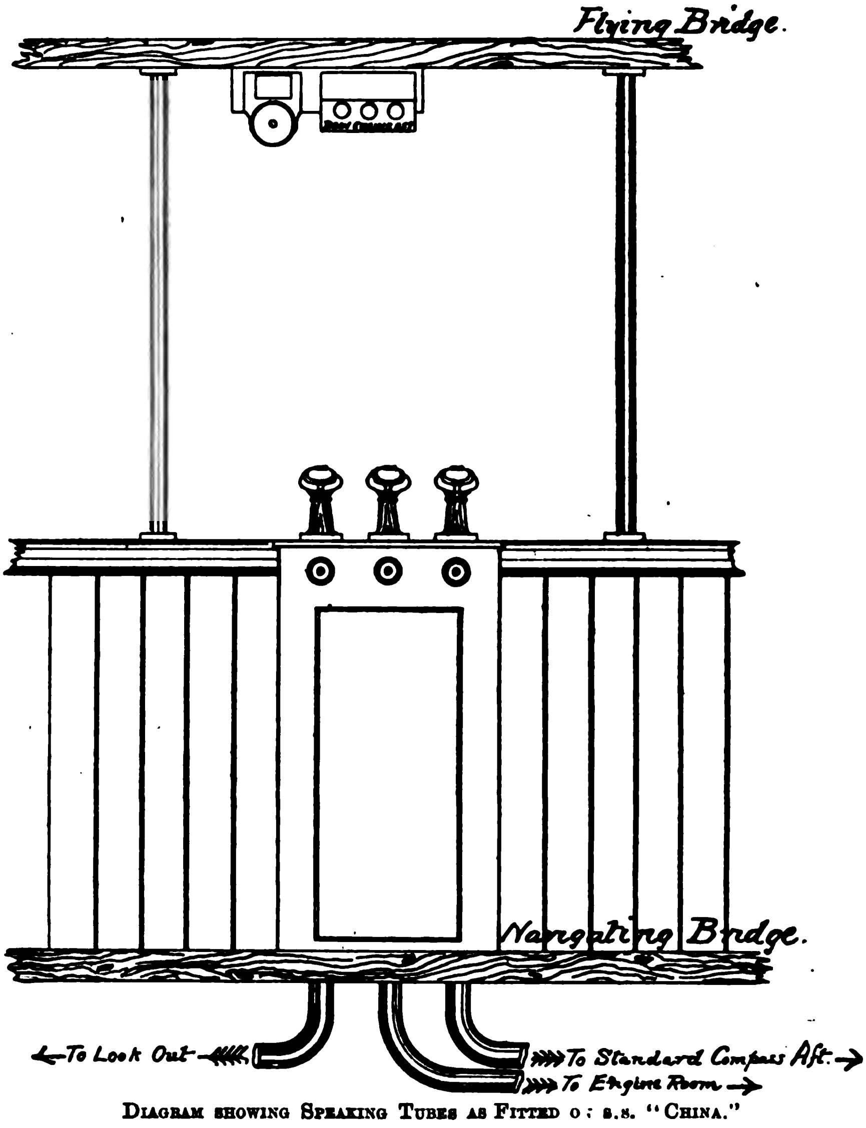
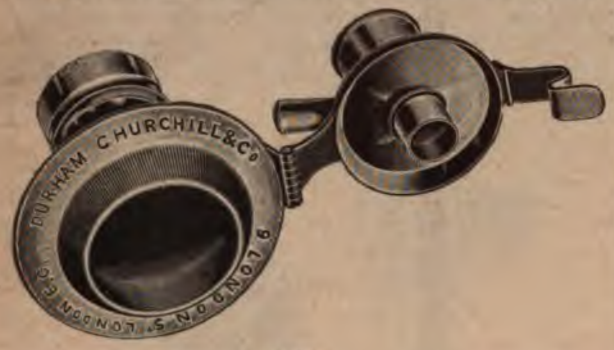


Diagram showing Speaking Tubes as Fitted on s.s. "China."

By reason of the fact that an efficient speaking tube is self-evidently a very satisfactory "stand-by," and further that it is not confined to a few set signals, but gives unlimited facilities for communicating on subjects entirely beyond the range of the mechanical telegraph, Captain Rose has given the subject his attention, and has invented an improved system of voice tubes which overcomes all the disadvantages existent in the old-fashioned speaking tubes.

That he has achieved a marked advance is demonstrated by the large number of steamers that have lately been fitted with this inventor's patent speaking tubes, including the last two new vessels, the *India* and the *China*, built to the order of the P. & O. Co. To give some idea of the extent of the installation on these ships, we may mention that the length of tube from the bridge to the engine-room is nearly 300 ft., while that from the bridge to the look-out forward is 160 ft., and from the bridge to the standard compass aft, 410 ft., and although the stations are so widely distant, the officers of the steamer bear excellent testimony as to the value and efficiency of these tubes. As an evidence of this we may mention that the *India* on her last voyage was being manœuvred off Suez in waters that afford scant room for a vessel of 8,000 tons, when the mechanical telegraph suddenly broke down, and the orders from the bridge were conveyed to the engine-room by the speaking tube until the repair of the telegraph could be effected. Every order from the bridge was clearly heard in the engine-room, even when the engines were running at full speed. We have heard of another case in which an order was given to go full speed astern, and on the engineer attempting to do so he found the reversing gear had jammed, and he could not carry out the order. Being provided with one of these speaking tubes he was able to report to the captain immediately, and the order was given to let go the anchor; but for this the ship would have been in collision before the captain could have been informed why the engines were not put astern as ordered. It may be mentioned that Captain Rose's speaking tubes are specially constructed and arranged throughout, and as a great length of piping does not admit of the usual blowing of a whistle by an intending user, electric call-bells are provided. We illustrate in the adjoining diagram views of the mouthpieces as fitted on the navigating bridge of the s.s. *China*. The tubes are led up inside a teak casing on the top of which three mouthpieces are fixed and immediately below the flying bridge is fixed a box containing the electric call-bell and the indicators connected to the three stations referred to. These tubes were fitted by Messrs. Durham, Churchill & Co., the proprietors of Captain Rose's patents, and the two large vessels, the *Egypt* and *Arabia*, now building for the P. & O. Co., are to be similarly equipped.



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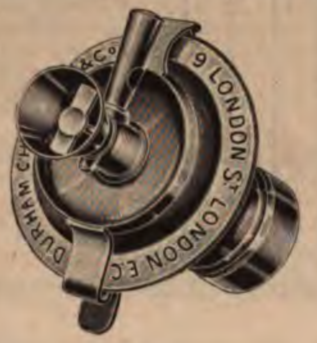

CLOSED.

They have also recently fitted, or are now fitting, tubes to three cruisers for the Dutch Government, one torpedo boat destroyer for the Austrian Government, one armoured cruiser for the Russian Government—the installation in the latter case consisting of 49 tubes—and boats for the London and North Western Railway Co., the Barrow Steam Navigation Co., Royal Mail Steam Packet Co., Great Western Railway Co., and the Netherlands-American Steam Navigation Co., have also been fitted with them.

THE FLEETS OF THE MAIL LINES.

(From our own Correspondent.)

The Union Line

has had the third of its present addition to its fleet of "G.'s," launched at Belfast by the wife of the Viceroy of Ireland, and so now the line has in the water a fleet of vessels unsurpassed in comfort and safety and in uniformity of design for the carrying on of its intermediate service. There are no less than seven of them, all twin-screws, all fitted with triple-expansion engines, and all hailing from the same famous yard. The only difference between any two of the sisterhood is in the matter of size, the later vessels being of larger tonnage than those first built, a circumstance which may be taken as one of the proofs that the move was fully justified.

The Hamburg Company's

steamship *Augusta Victoria* was "drawn" in the Alexandra dock at Belfast on the 9th January, preparatory to the lengthening process of which I have already spoken in these Notes. It is said that the operation took only seven minutes and was carried out with such exactitude that the two portions were in line to the truth of 1-32nd of an inch. We shall shortly hope to see how the process has affected the ship's speed and earning power.

Breaking up old Ships.

I spoke last month of the imminence of the sale of the old Holyhead mail steamers. The course of the present month has seen three of the quartet pass to the shipbreaker at the price of about £3,000 a piece. In this regard I may mention that I have been rather struck in recent years with the interest with which many persons follow the fates of old steamers which have earned fame in the Fleets of the Mail Lines. Perhaps some of those who purchase photographs of old steamers with such avidity and who will even send men down to take photographs of the last state of a poor old hulk which once was interesting and beautiful, will take a hint from my personal experience. I had reason of my own for considering the *Oceanic*, the pioneer of the White Star Line, a ship of to me the greatest importance, and accordingly I was anxious to possess what souvenirs I could of the old craft. I headed an expedition to the Victoria Dock about a year ago with a view to taking snaps of her and, for the last time, seeing over the first of modern passenger steamers. But the Fates were unkind. Her then owner did not favour the traveller from the west and we were not allowed aboard, whilst the weather was of such a black, foggy character that the snaps were all failures. Bemoaning this experience to a shipping friend a few weeks ago, I was told to go to Vauxhall and interview Messrs. Henry Castle & Sons, the well-known shipbreakers, through whose hands have passed so many famous ships from the *Great Western* downwards. They had, it appeared, on investigation, a small parcel of teak from the old ship. From that parcel they have made me a couple of useful chairs suitable either for the study or the garden. My demand for chairs is not unlimited and my readers are probably also soon satisfied in this regard. But small chairs are not the only things that amateurs of shipping relics can obtain from this source. There are seats for gardens, summer-houses, smoke-room tables, constructed with neat and nautical gratings, gates and numberless other useful things which will enable those who care to do so to have many relics of old friends constantly before their eyes as they sit at home at ease.

The Castle Line

has had another of its new type of intermediate boats launched. This is the *Raylan Castle*, built by Messrs. Barclay, Curle & Co. She is a sister to the *Dunolly Castle*, put into the water from the same yard in November. At the other end of the scale there have just been two removals. One was the *Grantully Castle*, a vessel which will be remembered as a former scene of Sir Donald Currie's hospitality to Mr. Gladstone. She has gone to a Liverpool firm, and will be engaged in the South American trade. The other is the *Warwick Castle*, which is only arriving home in the course of the present month of January.

The American Mail

question is never left at rest by the New York correspondent of the *Times*. He still, too, gets his information from tainted or, at least, very ill-informed sources. Thus a week or so ago, in making a comparison between the performances of the westbound Cunarder sailing with the mails of Sunday from Queenstown against a Southampton American Liner which left the previous day, he not only ignored the fact that the British steamer had a day's later mails, but he actually misstated the facts on which he relied. The omission was, perhaps, justifiable because every one who is interested in the American mail question is supposed to know, and bear in mind, the fact that the Cunarder carries mails written up to the close of business on Saturday, whilst the American mail practically closes on Friday night. But the other statement seems wilfully calculated to mislead. He says the American vessel arrived (at New York) "on Friday the 16th, and duly delivered her mails." Now the inference from this statement is that she delivered her mails on Friday, the 16th. This cannot be the fact, for the *Shipping Gazette* informs us that she passed Fire Ireland at 11 p.m. on the Friday, and she could not therefore have been at New York at all on Friday, the 16th, nor would she even have quite reached Sandy Hook, which is the real objective of mail boats so far as their sea passages are concerned. Her mails were doubtless in the hands of their addressees in New York at the commencement of business on Saturday. The Cunarder was a reserve ship, and she delivered her mails in time for business on Monday, and if Sunday had been a working day would have given them to business men on that day. She had arrived—unknown to the correspondent—at the very time he penned his attack. But the New York Post Office has deserted its position about giving the "mails to the fastest boats, irrespective of their nationality." It now gives them to the American Line always, and quite right too. The most conspicuous instance we have had of its change of policy was the occasion in January, when the *Paris* and *Majestic* sailed on the same day and almost at the same hour, and the *Paris* took the mail in spite of the fact that it had been publicly announced that she had one engine disabled, and would therefore make the voyage at about three-quarter speed.

The "Paris"

indeed has been most unlucky. She has only just completed an extensive overhaul at Southampton, and now she is back again there under repair. On her last voyage to the westward she slipped the sleeve of one of her propeller shafts about 8 inches, and rendered it impossible to use that set of machinery at all. Yet the American line was determined not to miss the sailing, and also perhaps to have the work of repair executed in England. And so they gave public notice of their intention to send her across under a single engine. In this they acted with great propriety. Passengers were certainly entitled to notice of such an intention on the part of the shipowners, though such openness is not always characteristic of those who manage steamship lines. Some passengers are said to have withdrawn on receipt of the notice. But unless they were pressed for time there was no reason why they should have done so. She arrived safely at Southampton about three days behind her usual time, and demonstrated once more the invaluable aid which the twin-screw principle gives to the passenger steamer. By the way, there has been recent evidence of the wisdom of those tramp owners who have gone in for this principle. A very large cargo boat—one of the largest single-screw vessels in existence—broke her shaft in the Atlantic in December, and after drifting about for some time had to seek assistance, and was towed into St. Thomas's. She has thus subjected herself to the possibilities of a salvage suit, a certain long delay before she can proceed on the voyage on which she was engaged, besides giving a vast amount of anxiety to all who are interested in her and those on board of her. The lesson that twin-screws are the best may well be taken to heart by all classes of steamship owners.

Publications.

I have received from the White Star Line a very well got up little volume, containing a history of this famous British Line. It shows an attractive cover, with the flags and funnels of the most important lines and the signals of the international code. There are excellent illustrations of the vessels which have made the reputation of the company, with portraits of some of the men who have handled them. Then there are representations of some of the scenes witnessed by the traveller at both ends of his journey, and copious maps of his land journeys. The whole is rendered more interesting and useful to the passenger by some "suggestions" as to cost of a trip, engaging berths, passports, the best mode of carrying funds, taking care of valuables, allowances of baggage and the rules of the ship as regards passengers' conduct. A table of ocean distances is given. A good deal of useful information as to ship's time is afforded, and also a clock showing the difference in the times of various important places. Much witty suggestion is made for the purpose of abolishing "the bore" at sea, and this is rendered the more palatable by the marginal pictures, which are well fitted to give point to the remarks in the text. Then comes a travellers *vade mecum* of useful phrases in French, German and English, and a telegraphic code for the use of travellers. There are also tables of fares in Europe and in America, and some information as to the money on both sides of the Atlantic. Finally there are leaves for a diary and for autographs of the friends made on the trip. The whole is calculated to be a useful handbook to the traveller, an attraction to those who think of crossing the herring pond, and a very pleasant reminder of the days spent under the White Star flag.

Marseilles and Brindisi

Nowadays, of course, the passenger who is anxious to make the most of his time in the old country embarks on the outward trip by the P. & O. at Brindisi, and, when coming home, lands at that port, whilst his Orient compeer uses the port of Naples in a similar fashion. But the new departure which was inaugurated on the maiden trip of the new P. & O. liner *India* was really a reversion to a system older than the ports of Brindisi or Naples (for this purpose), nay, much older than the Orient line itself. In the early days of the P. & O. the fast paddle steamers of the line ran the passenger by the "overland route" to Malta and Alexandria, whence he crossed by omnibus in early days, and later on by rail, to rejoin the P. & O. flag in the Eastern seas at Suez. Now Marseilles sees a chance of regaining her position as the mail and passenger port to the East and South, and is endeavouring to suit her railway and port accommodation to the most modern ideas of comfort and despatch. Whether she succeeds in her object or not, this is all for the good of the now pampered globe-trotter, who will find his convenience considered here and also at Brindisi, for the Italians are determined not to be behind, and to give facilities also, so that they may hold what they have, remembering the advantages of the man in possession.

The West India Royal Mail Company's

three old steamers were disposed of in January. They realised between three and four thousand pounds each. Of these vessels two are reported as about to be broken up on the Thames, whilst if possible, a worse fate awaits the third, which fetched the highest price of the three by a comparatively small sum. It is reported that she is sold to foreigners and will be used as a public yacht. Public yachting, if properly conducted, is a business profitable to the shipowner and pleasant to the passenger, as experience in the case of the vessels of the Orient, Hamburg-American lines, the Compagnie Generale Transatlantique, and other well-known and respected firms shows. But the undertaking needs business experience, and some of the foreign public yachting ventures undertaken by persons with little capital and no great experience has been lamentable indeed. To fall into such hands must be, from a high-class old trade, an ignominy worse than death, and I only hope that this old West India boat, the name and nationality of whose purchasers has not transpired, may have fallen into the hands of those who will use her with credit and profit to themselves and to the satisfaction of those who travel by her.

The Stowaway Nuisance

has attained considerable proportions recently, and the experience of the Castle Line in this regard seems to have been especially unfortunate. The daily Press has made some comment on the alleged hardships endured by some professedly involuntary passengers by the *Dunvegan Castle* on her most recent homeward trip. We may, in one or two cases, be prepared to accept the explanation that there was no intent to stow away, and that those who came home without tickets did not do so with intent. But there are numberless cases where the intent is manifest enough, and we must regard these cases generally from the point of view of those who find persons on board steamers without tickets and without ratings. They are bound not to accept the tale which is put before them, because no evidence can be given in support of it, and the same tale is put forward in every case. The truth of the story can only be investigated at the end of the voyage, when the keep and carriage have been obtained. So, naturally, everything is presumed against the uninvited guest. The nuisance is rife enough now, when stowaways are sternly treated; it would be infinitely worse if they were treated as pets.

In this regard I may cite the action of the West India and Pacific Steamship Company of Liverpool, a line which has also been a good deal troubled by stowaways. There a notice is fixed up warning their crews against in any way assisting in secreting unauthorised persons on their ships, and against in any way conniving at such secretion. At the same time notice is given to the intending stowaway as to what his fate will be if he successfully reaches blue water before discovery. He will not reach the land of promise he seeks. He will be kept on board and brought back to Liverpool, there to be dealt with by the local magistrates. This rule, if adhered to, will assuredly lessen the evil. For failure to benefit by one's action, is a far greater deterrent than punishment.

The Expedition to Benin

has once more shown the public the advantage of having great private enterprises in touch with those departments of the public service which are entrusted with action in times of emergency. Everyone knows now of the sudden determination to send an expedition to Benin. A hospital ship was a necessary part of such a force, and the P. & O.—who have on previous occasions provided such vessels as the *Carthage*, and I think the *Coromandel*—were naturally the people to whom the authorities turned. An evening newspaper gives an interesting account of what followed. The great Leadenhall firm determined that the *Malacca* was the most suitable ship for the purpose at the moment available. She was on the point of leaving the Thames. They telegraphed to stop her. Meanwhile she had just parted with her tender. As it reached the shore it set up an extraordinary whistling, and signalled violently with the company's flag. These proceedings were understood to be a signal for return, and back came the *Malacca*. Out came her cargo, in went coal enough to take her to the mouth of the Benin river and back without further supplies. In too went all kinds of medical comforts and supplies. But a great deal of almost structural alteration had to be done. Decks were laid where only beams had been. Hospitals were constructed where cargo had lain. This meant cutting port holes in the skin, and providing additional facilities for ventilation by artificial means. Extra spaces had to be lighted, and further electrical apparatus had to be shipped. Bulkheads had to be pierced with passageways, and efficient means to be provided for sealing the openings now made in case of emergency. The vessel had to be painted throughout. Yet it was all done in less than a working week, and the vessel got away with her new complement of nurses and medical men. This is smart work, and it reflects great credit on all connected with it.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(*From our own Correspondents at home and abroad.*)

IN all probability before the end of the month the country will have become acquainted with the measures, which the Government consider to be necessary for the adequate provision of our naval wants. There is every reason to believe that the Cabinet has determined to make proposals, which, in the opinion of its naval advisers, are sufficient to enforce, if necessary, our claim to supremacy afloat. Sir Michael Hicks-Beach, who is in control of the purse, the Duke of Devonshire, who is at the head of the Council of Defence, and other statesmen directly interested in the matter, have recently spoken in such a way as to leave little doubt on the subject. The country, as is now obvious, is ready to vote whatever sum may be considered needful and the only question likely to arise will concern the details of the scheme submitted to Parliament. There are three elements of naval efficiency: men, ships, and works. So far as the last-named is concerned there cannot be very much to do. The Bills which have already been passed into law tie the hands of the Government in this respect, for what has been begun must be completed. In the matter of ships it is more likely that discussion will arise. The advocates of what has been termed the moderate-dimension school will be ready, doubtless, to question the expediency of putting, to their mind, too many eggs in one basket. On the other hand those who contend, and we are to be found among this class, that more battleships are required, will certainly make their demands with no uncertain voice. Nor do we expect that the Admiralty will be found to hold a different view. But there is much cogency in the argument that we are already building faster than any other Power, and that our resources being larger we can afford to wait until the end of the year before commencing new construction in this direction. Quite a different matter is that of the personnel.

The Navy on a War Footing.

It is a fallacy hard to kill that the Navy is in want of men. The fact is that the Navy can always have as many men of the very best quality that the country likes to pay for. So out of proportion to our wants are the applicants at Spring Gardens that twice during the past year was the standard raised, and in spite of this upwards of 40 per cent. of the candidates for admission to the lower deck of our ships of war, as British seamen, were rejected. It is not as regards the supply of men for peace purposes that there is any difficulty, but what is wanted, and what we have not got, is an adequate and sufficient reserve of trained men to meet the necessary expansion of the Navy for war. It is well known that it is the intention of the Admiralty to increase the peace quota until we have a hundred thousand men actually in the active service. Beyond this the naval authorities are unlikely to go, seeing that it is necessary to give to these men a sea training, and that we have already in commission a very much larger number of ships than has hitherto been the case. And where on foreign stations the number of ships has not been increased, the size and power of individual ships, relatively to those they relieved, has been much enhanced. At present the Admiralty would have in war time to fall back upon the Royal Naval reserve, a force as to the efficiency of which many doubts have been expressed. Much of it is good, but it is small in number and scattered all over the globe. Moreover, it is feared that already all the men to be obtained from the merchant marine for this force have already been obtained. In other words, if the force is to be increased there must either be an increase of the material or some other source must be taxed. We ought to be able to obtain a very large reserve of most useful seamen as the French do for their Inscription Maritime from the sea coast and fishing population. Some of the fishermen round our coasts would make excellent men-of-warsmen, and we may expect that some proposition in this direction will be laid before the House of Commons.

The Trades Union Congress and the Dockyard Labourers

A deputation from the Trades Union Congress recently waited upon the First Lord of the Admiralty, in order to protest against labourers doing the work of mechanics in the construction of war vessels in the Government Dockyards. The deputation included Mr. J. H. Wilson, M.P., Mr. John Wilson, M.P., Mr. S. Woods, and other representatives from labour organisations in different parts of the country. These gentlemen contended that the grievance they complained of was an evasion and subversion of the Fair Wages Resolution, passed by the House of Commons on February 13th, 1891, and that as the Government contracts for shipbuilding material are sub-contracted to firms who neither pay the rate of wages current in the district, nor comply with the resolution in any respect, there should be an impartial investigation into the matter Mr. Fox, representing the Boiler Makers of Cardiff, argued that these labourers were composed of all sorts and conditions of men, men who were driven as a last resource to employment of this description. Mr. Goschen warmly protested against this. He said that for Mr. Fox to say that our labourers in the dockyards are sent there by desperate straits was a slur on a large body of industrious men. The Boiler Makers' representative certainly made a mistake here, for to run down one body of men in the expectation or hope to better another is not good policy to our mind. There is no doubt, as Mr. Fox said, that a large number of firemen, seamen and soldiers are employed upon the building of great warships, but why these men cannot do the work as efficiently as any other men it is difficult to say. There must necessarily be new men starting every week in all the shipbuilding yards throughout the country, but it is not many weeks before they become fairly skilled at their work. Mr. Goschen, in answer to the deputation's main plaint, gave them to understand that the men they complained of were in continuous employment, and that a certain amount of interchange of work was necessary in order to avert the necessity of discharging men after certain ships had been completed. The deputation had to be content with this, and retired after thanking the First Lord for his courtesy.

Portsmouth Dockyard.

The most important event in connection with this yard during the past month is the laying down of the *Canopus*. During the first week of her construction 230 tons of material were built into her and apparently she is to grow proportionately fast and will probably be launched within eight months from now. It is true that the *Prince George* when begun grew at a faster rate, 300 tons having been built into her in one week, but these performances are really no indication of the length of time which will elapse before the vessel is completed. Nor is the date of launching any criterion in this connection. The *Eclipse* cruiser was launched long before the *Prince George* was commenced and yet the *Prince George* was in commission before the *Eclipse* had been passed into the Reserve. It may be fully anticipated that the construction of the *Gladiator* cruiser will suffer by the competition of the *Canopus*. At the same time there have not been signs of it at present. She is going on fast and has recently had her bows strengthened with steel plates to protect her from a raking fire when chasing and to strengthen the ram. It will be remembered that the *Forte* class of cruiser were treated in the same way, although there 1-in. plating was used instead of two. The new yacht will not be built here as was expected, but at Pembroke. We have, however, plenty of work in connection with the repairs of commissioned ships and putting others in commission. The *Powerful* and *Terrible* have also given considerable work. The Channel Squadron ships have now left and it is reported that before returning they are to carry out a series of progressive and comparative tests. No doubt it was with a view to this that the *Prince George* was attached to the Squadron.

The Distribution of the "Edgar" Boat Fund.

The Soldiers and Sailors' Families' Association certainly deserve great credit for their praiseworthy efforts in the matter of the money which was subscribed to the *Edgar* Boat Fund for the benefit of the relatives of those sailors who lost their lives owing to this lamentable disaster. The fund amounted to £2,687 6s., and this sum the trustees resolved to hand over to the above association for administration. The whole of the money will be practically shared amongst those for whom it was subscribed, and no charge whatever will be made for administration. It has been decided, as in the case of the *Serpent* Fund, to invest £2,600 with the English and Scottish Life Assurance Association, who guarantee that £2,891 4s. shall be paid in quarterly payments, covering a period of eight years, as well as interest at 3 per cent. on yearly rests of any balance left undrawn. The fund has been distributed as follows:— To the four widows and five children pensions for eight years on the same scale as the Admiralty pensions, together with a sum of £20 set aside for each of the five children, if living at the end of twelve years; pensions for five years to 34 dependent relations from 2s.6d. to 6s. per week, and in three cases gratuities of £20, £10, and £10 respectively. The way in which the fund has been handled by the association cannot be too highly commended, for it is only in this way that the money can reach those for whom it was originally intended.

Sir Michael Hicks-Beach on the Increase in Naval Expenditure.

Sir Michael Hicks Beach devoted the greater part of his speech on January 8th to the Navy. He stated that in the last five years 26¼ millions had been spent on the construction of new ships—5¼ millions for each year. In the current year something like 7¼ millions would have been spent when the accounts of the year were closed. Other countries, said he, were beginning to take alarm, and hinted that this should be avoided, as it would not be well for us to provoke ruinous competition. "Supposing France," said he,—he did not use the comparison in a hostile sense—"as our nearest neighbour, and as the continental power that had the largest navy, choose to make a greatly increased expenditure upon her navy, very well, we should have to do the same. It might be a mistake for both countries. It would be far better if England's neighbours would be good enough to consider that the policy, not merely of one party, but of both parties, of everybody in the United Kingdom, was to maintain our supremacy at sea, and whatever happened we would maintain our supremacy. It was necessary to continue in that policy, and therefore it was necessary to incur increased expenditure, not merely on the Navy, but in other matters as well." We heartily echo these sentiments and agree with the speaker that the Navy should be strong enough to defend the United Kingdom and the Empire at large, at any costs. For every ship that the two next strongest Powers built, England ought to build two. We increase our Navy only; our neighbours increase their armies as well. We depend upon our ships to render these great armies powerless, and Sir Michael spoke the truth when he said that the question of taxation or expenditure ought never to stand in the way of this.

Devonport Dockyard.

(7.) With the departure of the western division of the Channel Squadron, the yard looks a little empty, but during their stay they have occupied a great deal of attention which may now be directed to shipbuilding work and other business in hand. We are also to lose the *Phœnix* and *Algerine*, which will hoist their pennants on February 11th for the China station, where they take the places of the *Swift* and *Linnet*. These will be the fourth ships commissioned in Devonport already as the *Amphion* and *Harrier* have already been taken from the Reserve. With the exception of the *Blake* the ships of the Channel Squadron needed but slight refit. To make up for this the *Blake* has given a great deal of trouble, and it will be interesting to watch how she gets on during the new cruise of the Squadron. What is probably the last figurehead to be built for the Navy is now being constructed at Devonport by Mr. Trevennen for the *Nautilus* brig, which lost her old one in collision some little time since. The new carving will represent a water nymph holding in her right hand a nautilus, while she supports her drapery with her left. From the tip of her toes to the crown of her head she will be 6 ft. 7 in. in height, a fine figure of a female at any rate. Mr. Trevennen, it will be remembered, it was that was responsible for the famous figurehead of the *Black Prince*, in carving which over 400 ft. of timber were used. On February 15th the keel-plate of the *Ocean* is to be laid down, a ceremony looked forward to with some interest, as she is the first battleship to be built in the yard. A great quantity of material has already been prepared for working into the ship, and it is fully expected here that she will be finished as soon as her sisters at Chatham and Portsmouth.

A New Protection against Torpedo Attack.

A novel system has recently been suggested by Dr. Jones for the protection of battleships and other vessels against the attack of torpedo boats. He proposes to fit the ships with steel shields made in the form of the hull, which in ordinary circumstances will rest against the vessel herself. As, however, the shields are fastened to the ship at the top with hinges, and are loose at the bottom they are capable of being projected outwards from the hull to a distance of 20 ft. The notion is that these shields and the cushion of water between them and the ship will be sufficient to protect the latter from material injury should a torpedo be exploded against the guard. As everyone is aware, the present arrangement of booms and nets in the shape of a crinoline is not only exceedingly cumbrous, but has been rendered untrustworthy by the advent of the new cutter. There cannot be a question that Mr. Jones's system is simpler than the old form, but it is more than probable that the cost would be greater, and the protection no more efficient. With the latest form of torpedo it is quite possible to make them run in such a way that they would rise as they approach the ship, and inasmuch as the steel shields would be higher at the outer edge than when in the usual position, a vulnerable portion of the hull would remain uncovered for this system of attack. It is suggested that the system of Dr. Jones could be used as well at sea as in harbour, but we are of opinion that the loss of speed would not be set off by the problematical protection given by the steel shields when expanded. The scheme is, however, worthy of consideration, and we should not be surprised if it were tried before long.

The Torpedo-Boat Destroyers.

The construction of torpedo-boat destroyers, which has been pushed ahead with such commendable alacrity in this country, has given an impetus to the building of similar vessels by many foreign Powers, and the English shipbuilders who have made a speciality of this kind of work have profited thereby. It seems highly probable that ere long the destroyer, by its very presence, and not by the aid of its guns, will ring the knell of the torpedo boat. During the next year 48 new destroyers should be delivered for the British Government, and they would be distributed at the three principal naval ports. To Portsmouth will be sent the *Brazen*, *Recruit*, *Electra*, *Vulture*, *Star*, *Whiting*, *Bat*, *Chamois*, *Crane*, *Flying Fish*, *Bullfinch*, *Dove*, *Cheerful*, *Mermaid*, *Fawn*, *Flirt*, *Violet*, and *Sylvia*. The Chatham detachment will consist of the *Desperate*, *Fame*, *Foam*, *Mallard*, *Angler*, *Aerial*, *Avon*, *Bittern*, *Arab*, *Kestrel*, *Albatross*, *Coquette*, *Signet*, *Cynthia*, and *Express*; while at Devonport the contingent will consist of the *Quail*, *Sparrowhawk*, *Thrasher*, *Virago*, *Earnest*, *Griffon*, *Locust*, *Panther*, *Seal*, *Wolf*, *Otter*, *Leopard*, *Fairy*, *Osprey*, and *Gypsey*. In addition to these 48 there are already in the water others, bringing up the number to 90, so that we may consider ourselves well advanced in this particular species of construction. A few boats have already been sent to the Mediterranean and China, and it may be expected that during the next twelve months the number abroad will be considerably increased. Indeed, the exigencies of modern naval war seem to demand that every fleet should be accompanied by a flotilla of destroyers, and the best plan yet devised for keeping these boats in constant readiness is that which is in use at home. At each of the naval ports there are instructional flotillas, with others in reserve, and by making frequent changes all the boats get a certain amount of practice, while the crews, whether on deck or in the engine-room, gain experience of the greatest value.

Chatham Dockyard.

The first two ships to hoist the pennant at this yard this year were the *Howe* and the *Torch*, the former taking the place of the *Warspite* at Queenstown and the latter proceeding to Australia to relieve the *Ringdove*. The next ship to be commissioned, on February 4th, is the new cruiser *Minerva*, which, it will be remembered, was built and engined at this yard. She, with the *Endymion*, will carry new crews to China for the flagship there, and the gunboat *Rattler*. The *Monarch* is also to be commissioned very shortly for service, first at Zanzibar and then at the Cape of Good Hope, where she relieves the *Penelope*. The *Goliath* commenced here on January 11th, and is proceeding apace; 160 tons were worked into her during the first week, and it is quite anticipated that she will take the water in August next. It is considered here unfair to compare the progress of the *Goliath* with that of the *Canopus* at Portsmouth, as Chatham has received far less material for her ship's construction than has been delivered at the other port. There has been much talk about next year's programme, and it is conjectured that in addition to the cruiser of the *Furious* type, which it is known will be laid down here, there will also be another battleship put in hand. There is also the refit of the *Superb*, *Warspite*, *Audacious*, and *Dreadnought* to be taken in hand, so that, with what is now in progress, there should be abundance of work for the establishment. It is expected, also, that provision will be made in next year's Estimates for commencing new docks and establishing a torpedo school in Stangate Creek, where torpedoes can be tested and repaired instead of sending them to Portsmouth. Owing to the increased number of men in the depôt it is intended to allot the *Agincourt* as an overflow ship, and she is now being prepared for the purpose.

The Steam Trials of the "Powerful" and "Terrible"

The steam trials of the *Powerful* and *Terrible*, which commenced as far back as five months ago, have now been completed and with complete success. Sir John Fisher, Sir Wm. White and Mr. A.J. Durston, the Engineer-in-Chief of the Navy, with all others concerned are to be congratulated on the result achieved. The watertube boilers have fulfilled all that was expected of them, the long delay being attributable to altogether different causes, although at first these were erroneously supposed to have been responsible. The trials were of an exceedingly searching character, but this is only as it should be. It is far preferable that any defects should show themselves while the trials are being made than after the vessels have been commissioned and have put to sea. The long delay was due to several causes, friction in the slide valve of the port high-pressure cylinder, overheating in the funnel casings and ammunition passages, and bad weather, among others. The *Powerful* will, about May next hoist the pennant, and under the command of Captain the Hon. Hedworth Lambton, will leave for an experimental cruise to the China station. The *Terrible* will probably join the Channel Squadron in the same month. The latter vessel on her steam trial reached a speed of 22·41 knots. On her third trial it was found that with 103 revolutions she made an average of 18,493 H.P., and with a coal consumption of 1·7 lbs. per I.H.P. per hour, her mean speed on the measured mile was 20·96 knots. Very dirty weather was encountered in the early part of the run, and in the latter part she had both wind and tide against her. This is a remarkably good showing, and as it is almost a certainty that she will be able to maintain this speed she may undoubtedly be considered the fastest warship in the world.

The New Battleships.

The design for the new battleships which have just been commenced shows considerable alteration from that of the previous type. In the *Majestic* class the point of the ram projects from 11 ft. to 12 ft. beyond the vertical stem, and its normal position, when the vessel is at her usual displacement, is some 16 ft. below the water line. In the newer class the point of the ram has been raised several feet, in fact just to that height where it might be expected to strike a blow immediately beneath the belt of the antagonist, and the distance from the point to the perpendicular stem is considerably increased. By these alterations it appears likely that the penetrative power of the ram is more fully developed. It has always been criticised in the old design that the blow struck was too low, remembering that in all probability the vessel attacked having been some time at sea would have risen in the water, and if the blow fell below the turn of the bilge it would be less likely to inflict serious injury than if delivered somewhat higher up. A further alteration directed towards improving the handiness of the ship is to found in the circumstance that the forefoot is cut away at a sharp angle, thus shortening the horizontal part of the keel, a peculiarity which is also to be found in some of the more recent features. Proportionately to its increased power the ram has also been stiffened, the curve downward of the armoured deck and the plate running forward from the platform deck being made to converge in such a manner as to support one another and the ram point very effectively, and thus to obviate the possibility of the ram being forced back into the hull of the ship, while it should also strengthen it against a twisting wrench. It is noteworthy in this connection that in all the recent essays upon naval tactics ramming as a means for the destruction of an enemy has fallen into the third place. The gun has regained its former position; the torpedo is looked upon as the secondary weapon and naval officers are advised to rely upon the ram only in the last emergency. There are very forcible arguments advanced in support of this contention, and it certainly seems that to use one of our modern battleships for such a problematical and risky purpose as ramming must mean should never be attempted except as a last resource.

Sheerness Dockyard.

The *Gleaner* has been paid off here after three years' commission in the Mediterranean. The crew before leaving, made a very handsome present to the boys of the Sheppey Union Workhouse, in the shape of the whole of the gear of their cricket club. When the summer season arrives the boys should have cause to remember the bluejackets of the *Gleaner*. The *Bustler* tug is to be sent from here to Bermuda, in the same way that the *Sampson* some time since was sent to Malta. If it be correct that the *Hotspur* is to take the place of the *Terror*, in all probability the *Bustler* will be convoyed by the former ship across the Atlantic. The first ship to be commissioned here this year is the *Egeria*, surveying vessel, unless we include the *Speedy*, of the Channel Squadron, which has been recommissioned. The *Swallow's* refit is progressing rapidly although it has rather capsized the arrangements previously made. The cost of her refit is about equal to that estimated for the *Dolphin*, but she has been taken in hand first as being more modern, and better suited for foreign service than the *Dolphin*. The next ship to arrive here for refit should be the *Barracouta*, which will be home in a few weeks. The Fishery Protection vessels have been in the yard lately to undergo their annual refits. The *Hearty* and the *Onyx* will be completed early in February. The *Pomone* is making good progress although only laid down a month since, and she is to be completed for commission by the end of the present year. She will receive her engines from Messrs. Penn & Sons, but the *Proserpine*, launched some weeks since, is waiting for machinery, which is being made at Devonport, where also the machinery for the vessel to follow the *Pomone* will be made.

Kites for Naval Purposes.

The Admiralty has lately directed its attention to the subject of kites for naval purposes, and to this useful end ordered a trial to be made of a kite invented by Captain Baden Powell, of the Scots Guards. The experts appointed by the authorities reported most favourably upon it, and consequently it is possible that in times of war kites may become quite if not more useful than balloons. One advantage the kite will have over the balloon is that it could be used almost all the year round, while the balloon cannot be used for more than about 100 days out of the 365. The use of the kite in the navy for signalling, general aerial reconnaissance and even torpedo carrying, will be a step in the right direction, since they are not nearly so cumbrous nor expensive as balloons, and it is claimed for them that they can be used with greater efficiency. Experiments are still going on in America to find out whether a kite can be made to carry a man up with it, and if these experiments are successful, the result will be that it will be an easy matter for the passenger to take observations of an enemy's fleet, and in the matter of coast defence the kite will become especially valuable for reconnoitring purposes.

An Italian Naval Council of Defence.

The Italians have at last decided to create an Admiralty Council, and in its constitution it will largely resemble the French Superior Council of the Navy before General Besnard remodelled it. It is to be composed of the vice-admirals who are in charge of the naval stations at Spezia, Naples, Venice, Maddalena, and Taranto, and also the vice-admirals commanding the active and reserve squadrons, while the chief of the staff will act as its secretary, and it will meet under the presidency of the Duke of Genoa. This council will be assembled at the discretion of the naval minister, but it is not to be called together less than three times in every year. Its purpose is to advise upon mobilization, the constitution and organization of the *personnel* of the fleet, promotion of officers, new laws and regulations, the coast defence service, and the shipbuilding programme. It is also laid down that the Minister may in his discretion commit to it the direction of the naval manœuvres and the inspection of ships and naval establishments. In France, two years past, on one occasion no meeting was held for two years, the reason given being that the assembly of the council would have dislocated the naval machinery, and it is probable that the order in Italy obliging the council to meet three times a year may have to be modified. In practice the creation of these councils brings about something very like the machinery of our Admiralty Board, especially as it was on that occasion when Lord George Hamilton called together a number of naval officers of high rank to assist in deciding upon the *Royal Sovereign* type of battleship. How it will work in Italy remains to be seen.

Pembroke Dockyard.

Every one at this yard is anxious about the forthcoming Estimates. It is fully believed that a battleship will be the next order, but at present there is no more foundation for the hope than that sometime since the launching arrangements for such a vessel was being prepared for Number 5 slip. Good progress is being made with the *Hannibal*, and she will certainly occupy the time of all the hands on her at present until she leaves in the autumn. The *Andromeda* and the *Spartiate* are also growing apace, but it is fully felt here, that unless the staff of the yard is increased, it will not be possible to continue progress at the same rate. The wood sheathing on the *Andromeda's* bottom is now nearly completed. The launch fittings are in readiness, and the topsides have been cleaned and painted. It has caused some comment in the yard that wooden decks should be put in her after what occurred at the Battle of Yalu. It seems to be still a matter of uncertainty as to whether the new Royal yacht we hear about will be made here. The story is that she is to be laid down and completed by March, 1899, thus taking two years to build and furnish. Pembroke has always been a favourite yard for building the Royal yacht, and therefore it would not be surprising were the rumour to prove true. It is certainly very detailed, as we are told the new vessel will have engines of 15,000 H.P., and water-tube boilers to give her a speed of 22 to 23 knots, while, with three-quarters of her engine power, she is to make 19 knots. On a displacement of 4,000 tons, which is the size mentioned, a very fine yacht should be built, but it is hardly possible to make such a vessel serve the double purpose, as in the case of the yachts of Italy, Germany and Russia, of a cruiser and a royal conveyance at the same time. If she comes to us we shall certainly welcome her, and it will be strange if Pembroke cannot turn out as good a vessel as can be found elsewhere.

Shipbuilding in French Yards.

The private shipbuilders in France appear to be very active at present, so far as work for foreign Powers is concerned. At Havre M. Normand is to build five sea-going torpedo boats, probably of the destroyer type, for the Japanese Government. At the same port the Forges et Chantiers de la Mediterranee are completing the Russian cruiser *Svietlana* and are also about to lay down a couple of small protected cruisers to displace 1,800 tons each for Portugal. These vessels will carry an armament consisting of two 5·9 in. guns, one forward and one aft, four 4·7 in. guns in sponsons, eight 1·8 in. gun, a couple of machine guns and a torpedo tube. All the larger pieces will be on the Canet quick-firing principle, and electricity is to be employed for hoisting ammunition, ventilating the magazines and lighting the ship. The boilers will be of the Normand and Sigaudy water-tube type to give a maximum speed of 15 knots. At the La Seyne, the *Marshal Deodoro* is being built for Brazil. She is a cruiser of 3,126 tons displacement, and a sister ship to be named the *Marshal Floriano* is to be laid down in the same yard. The Greek ships *Psara* and *Spetsai* are also at La Seyne undergoing a charge of armament, and the Spanish vessels *Pelayo*, *Vitoria*, and *Numancia* are in the same yard for alteration and repair. It may be mentioned here in connection with the construction of the *Svietlana* that considerable activity is taking place in Russian naval construction. A sister ship of the *Sissoi Veliky* is to be laid down at Nicolaieff. It is further stated that two battleships of 12,480 tons each are to be built in the Black Sea, while in the Baltic the *Peresviet* and the *Oslyabya* are in hand with a cruiser of the *Rossia* type and three first-class cruisers and two destroyers are to be built. The cruiser *Ghilyak* is to be launched in the spring. At the yard of Messrs. Creighton, the torpedo-cruiser *Abrek* has been completed.

NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from December 22nd, 1896, to January 26th, 1897:—

Aborn, G., staff engineer, has been advanced to the rank of fleet engineer in her Majesty's fleet.

Banister, Charles, engineer to the *Edinburgh*, additional for the *Niger*, to date January 7th.

Barber, James H., engineer to the *Melampus*, to date January 19th.

Beal, William E., fleet engineer to the *Orlando*, additional for the *Katoomba*, when commissioned.

Bell, Lawrence, engineer to the *Harrier*, to date January 14th.

Bramsdon, W. H., staff engineer, has been advanced to the rank of fleet engineer in her Majesty's fleet.

Brown, Alexander, assistant engineer to the *Monarch*, to date January 26th.

Brown, Percival R. T., assistant engineer to the *Centurion*, additional for recommissioning.

Bryer, Sydney M. G., assistant engineer to the *Blake*, to date January 14th.

Campbell, E. J., engineer to the *Egeria*, to date January 14th.

Chamberlain, Edgar W., assistant engineer to the *Medea*, to date February 1st.

Dixon, Robert B., engineer to the *Centurion*, additional for recommissioning, to date February 1st.

Drake, Sidney J., engineer to the *Pembroke*, additional for the *Swordfish*, to date January 23rd.

Evans, Henry, assistant engineer to the *Centurion*, additional for recommissioning.

Figgins, John W., assistant engineer to the *Pembroke*, additional, to date January 26th.

Fryer, George H., engineer to the *Chamois*, to date December 23rd.

Gardner, John, fleet engineer to the *Monarch*, to date January 26th.

Gay, W. H., staff engineer has been advanced to the rank of fleet engineer in Her Majesty's fleet.

Guyatt, Edmund G., engineer to the *Victory*, additional for the *Sylvia*, to date January 8th.

Guyer, Frank, assistant engineer to the *Benbow*, to date December 23rd.

Hall, William H., assistant engineer to the *Majestic*, to date December 23rd.

Hardwick, W. W., engineer to the *Blonde*, to date January 23rd.

Haves, John E., engineer to the *Wallaroo*, additional, to date February 1st.

Hawkins, Hugh, staff engineer to the *Victory*, additional as overseer in Glasgow district, to date January 12th.

Holgate, George S., engineer to the *Triton*, to date January 14th.

James, Charles J., engineer to the *Victory*, additional for the *Bat*, to date January 4th.

Johns, Arthur J., staff engineer to the *Vivid*, additional for the *Niobe*, to date January 7th.

Johnson, William C., assistant engineer to the *Harrier*, to date January 14th.

Kilpatrick, Robert (probationary) assistant engineer to the *Centurion*, when recommissioned, undated.

Lancashire, Joseph E., engineer to the *Lapwing*, to date January 14th.

Lane, Charles, fleet engineer to the *Inconstant*, to date December 31st.

Larg, Alfred D. (probationary) assistant engineer to the *Repulse*, to date January 12th.

Markham, G. L., assistant engineer to the *Northampton*, to date January 14th.

Meaden, Nicholas, fleet engineer to the *Mildura*, undated.

M'Gregor, David J., assistant engineer to the *Magnificent*, to date January 2nd.

Moorshead, John E., engineer to the *Orlando*, additional for the *Mildura*, undated.

Morris, Owen A., engineer to the *Flora*, additional for passage out, doing duty, to date January 14th, and afterwards to the *Tauranga*, undated.

Moss F. S., acting engineer, has been confirmed in the rank of engineer in Her Majesty's fleet.

Murray, John A., chief engineer to the *Iphigenia*, to date January 19th.

Noll, G. W., engineer, has been promoted to the rank of chief engineer in Her Majesty's fleet.

Noll, George W., chief engineer to the *Sheldrake*, to date December 1st.

Norris, Colin M'K., chief engineer to the *Pearl*, to date January 7th.

Parker, W. R., engineer, has been promoted to the rank of chief engineer in Her Majesty's fleet.

Parker, William R., chief engineer to the *Pembroke*, additional for the *Gleaner*, when paid off.

Parrott, Jasper W. A., engineer to the *Pembroke*, additional for the *Angler*, to date January 23rd.

Pitt, John, fleet engineer to the *Centurion*, reappointed on recommissioning, undated.

Rashbrook, Henry S., staff engineer to the *Diadem*, to date December 31st.

Robertson, Gordon, assistant engineer to the *Vivid*, to date December 23rd.

Russell, Charles E. (probationary) assistant engineer to the *Blake*, to date January 19th.

Sanderson, Philip A., assistant engineer to the *Centurion*, when commissioned, undated.

Shawyer, James Alfred, fleet engineer, has been placed on the Retired List, with permission to assume the rank of Inspector of Machinery.

Sheen, Charles C., engineer to the *Sharpshooter*, to date December 23rd.

Skelton, Reginald W., assistant engineer to the *Endymion*.

Smith, Frederick P., chief engineer to the *Victory*, additional for the *Naiad*, to date January 12th.

Stevens, John G., staff engineer to the *Victory*, additional for the *Nelson*, undated.

Stewart, Charles E., fleet engineer to the *Vivid*, additional as overseer of machinery of *Hyacinth*, to date January 12th.

Stuttaford, F. R., engineer, has been promoted to the rank of chief engineer in Her Majesty's fleet

Stuttaford, F. R., chief engineer to the *Magdala*, additional for the *Assaye*, to date December 3rd.

Taylor, Ernest J., chief engineer to the *Orlando*, additional for passage out, to date January 14th, and afterwards to the *Tauranga*, undated.

Thomas, J. C., staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet.

Thomson, John, assistant engineer to the *Iphigenia*, to date January 19th.

Tregenna, R. H., fleet engineer to the *Agamemnon*, to date January 7th.

Tuckwell, Henry M. S., assistant engineer to the *Victory*, to date January 12th.

Vaughan, John A., engineer to the *Monarch*, to date January 26th.

Vincent, George H., assistant engineer to the *Orlando*, additional for the *Katoomba*, when commissioned.

Wand, Edward V., assistant engineer to the *Magnificent*, to date January 14th.

Watch, John S. staff engineer to the *Wallaroo*, undated.

Williams, Harry, assistant engineer to the *Iphigenia*, to date January, 19th.

Wishart, William L., fleet engineer to the *Albion*, to date December 31st.

HOAR & BROWN'S ANNUAL HARDWOOD MARKET REPORT, JANUARY 6th, 1897.

TIMBER AND PLANKS.

TEAK:	1896. Loads.	1895. Loads.	1894. Loads.	1893 Loads.
Landings	23,261	22,214	10,000	12,575
Deliveries	22,012	18,456	10,702	12,620
Stock, 31st Dec.	11,420	10,000	6,200	7,200

LOGS.—Importations for the last 12 months have been the largest known for many years, but the deliveries have kept pace with the arrivals. Minimum prices prevailed at the commencement of 1896, and the first indication of a change showed itself during the month of February, when several large orders were taken, and contractors found themselves short of stock. Since this period prices gradually advanced, until at the close of the year a difference of 30 per cent. in the value of cargoes was recorded, and the aspect of the market points to still higher figures. A strange feature in the upward movement was, that during the perceptible rise there was very little eagerness displayed by consumers and others to take advantage of the market by securing landed stock at the low figure it was then being offered at; and it was not until the year advanced that the old stocks, which in the meantime had much increased in value, were cleared off, thus giving holders a considerable profit on the early quotations. Consumers generally directed their attention to floating purchases, and practically left landed stocks alone, consequently the London market is still well stocked with really lower priced timber than can be obtained afloat.

Planks.—The rise in the value of logs did not appear to affect planks until the season had well advanced. At one time logs were realising a higher figure than planks, which can only be accounted for by the fact that the former have been more generally in demand. The high rates asked for new importations will retard operators from materially increasing their present holdings, which are sufficient for all ordinary purposes for some considerable time. Should, however, a further demand arise, the stocks must be reduced and shippers will reap the benefit.

Mahogany—Tobasco.—The market was fairly steady during the early part of the year. Large sized logs advanced about 25 per cent., but later shipments included a good proportion of 24 to 30 in. wood, and values quickly receded again to the level at which they now stand. **Honduras** of big sizes has held up well throughout the year, principally in consequence of some north-country panel orders of considerable magnitude being given out. Minimum prices have also been well maintained and prospects are good for further cargoes, which will come to an eager market.

African.—A healthy opening has shown itself, leading to a very fair demand for this comparatively new class of wood. Figures advanced steadily as the year went on, and prices may now be described as fully high.

Mexican.—Shipments show a falling-off compared with the general average, but the short supply has not been regretted among the trade, the poor quality of the wood preventing it being well taken up. Cargoes arriving met with little support, as in previous years.

Tecolutla.—It was expected that a much greater quantity of this valuable shipment would have found its way to London, but other ports being anxious for consignments, this market was saved from being over-stocked, and an easy trade was thereby promoted. At the best of times this timber goes off very slowly, through not being more generally known among consumers, but those who once use it generally continue to do so, on account of its mild nature and (up to the present) low price. It cuts excellent panels, but would meet with more favour if imported sounder.

Panama.—Shippers are still unable to consign any thoroughly sound parcels. The wood is very favourably received, and when convertible, is much sought after, the few sound pieces realising prices equal to the best Tobasco. Imports have not been excessive, although so many shaken logs help to materially lower the minimum of other qualities.

Cedar.—With this wood little has been done during the later months of 1896 in consequence of high prices, caused by light supplies. There was a clearance of half a million feet of Paraguay to a leading consumer at a low figure during the latter part of the year, and there now remains a similar quantity in first hands. The price being so much below either Honduras, Tobasco, or Cuba, there should be no difficulty in securing an outlet, especially as a considerable quantity of boat-building wood could be selected from this parcel.

Walnut.—Logs were realizing a very low figure at the commencement of the year, but freights advancing caused a decided increase in values, and present prices are 30 per cent. in advance of the early quotations. There is plenty of stock and speculators are scarce.

Whitewood.—Large quantities have been brought over at the lowest known prices, and first quality boards have been selling at 15 per cent. less than heretofore. There appears to be no cessation in the imports.

Sequoia.—During the whole 12 months an unprecedented market has prevailed. The trade, though moderate, has upheld prices, and would have gone even better but for an over-supply to the North, which kept a steady tone in London. For the next few months there will be no further arrivals.

Greenheart.—Since the early half of the year there has been little variation in values, and stocks have never been large. Business remained quiet, and holders have not reaped much benefit, after taking interest and dock rent into consideration.

Padouk.—There is ample stock for all requirements and very little demand. Prices are low, with no inclination on the part of purchasers to take more than the least they can possibly do with. Trade throughout the year can only be described as bad.

Sabicu.—Practically there is no demand; a small supply, but quite sufficient to last for some years at the present rate of consumption.

Taken all round the year 1896 will be remembered as one of the best trading years both with hard and soft woods, and the outlook for the coming year presents a cheerful prospect.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(*From our own Correspondent.*)

The representatives of the Federation of Engineering Employers' Associations and of the Amalgamated Society of Engineers, met in the County Hotel, Carlisle, on Jan. 19th to discuss the question of extra remuneration for services on trial trips, particularly in connection with torpedo-boat destroyers. At present there is no uniformity of charges, and the men seem to not only worry the employer, but to screw as much money out of him as possible. The conference commenced at half-past one o'clock, and before it both sides held meetings and considered the course to be followed in the discussion. The meeting, however, was not very prolonged. Colonel Dyer, who presided, placed the Clyde list, submitted by the Glasgow district, before the conference as the basis of discussion, but the delegates of the men objected, and said they had come to discuss the Jarrow and not the general question. The result was that the conference was adjourned for a fortnight, which is much to be regretted, and we sincerely trust that an amicable settlement will be arranged at the next conference.

The Institution of Engineers and Shipbuilders in Scotland held their annual dinner on Saturday evening, January 23rd, in the Windsor Hotel, Glasgow. The President of the Institution, Sir William Arrol, M.P., occupied the chair, and Professor Andrew Jamieson and Mr. Matthew Holmes acted as croupiers. Over 200 guests were present, among whom were the following:—The Hon. the Lord Provost, Sir Andrew MacLean, Brigadier-General Sir Donald Matheson, K.C.B., Deacon Convener Ramsey, Mr. Albert John Durston, C.B., Engineer-in-chief of the Royal Navy; Major W. P. Thring, commanding officer, Royal Artillery; Professor R. L. Weighton, Durham College of Science; Mr. John Henderson, Mr. William Foulis, engineer, Glasgow Corporation Gas Trust; Mr. Joseph Naismith, President Manchester Association of Engineers; Dr. Ebenezer Duncan, President Glasgow Philosophical Society; Mr. W. D. Courtier-Dutton, chief Surveyor British Corporation; Councillor Alexander Osborne, and Messrs. William Hamilton, J. G. Dunlop, John Inglis, James Rowan, James Weir, Thomas B. Seath, James Gilchrist, W. Russell Ferguson, A. S. Biggart, Anderson Rodger, Henry Murray, G. Russell, John Ward, James Denny, Charles Connell, Robert MacLelland, G. L. Watson, and David Rowan, jun. After dinner the loyal toasts were cordially drunk.

Mr. Rowan proposed the "Navy, Army and Reserve Forces." He said not many years ago, from an engineering point of view, the merchant service led the Navy. At the present moment, although the modern merchant service must be hard to beat, he would say if anything the Navy had the lead. During the last few years our fleet had been enormously increased, and they believed wisely increased. No great radical change had taken place in regard to propelling machinery, but water-tube boilers had been introduced first in torpedo-boats, and now in the largest cruisers. The speed of certain classes of vessels of the Navy had been augmented by about 50 per cent. He went on to say how Clyde men must all feel proud of the *Terrible*, a Clyde-built ship of exceptional size, power and speed, and which had gone through so successfully the various trial conditions required by the Government.

Mr. A. J. Durston, C.B., replying for the Navy, said, in the course of his remarks, that part of Her Majesty's dominions known at the Admiralty as the Clyde district, contributed, and was contributing a very considerable proportion to the strengthening of the fleet. That the fastest and largest war cruiser in the world, and also that the first of the new third-class cruisers for our Navy, were built by an eminent firm in the district, and that these two ships embodied respectively in their design the two new types of water-tube boilers adopted in the Navy, and further, that these two ships had just recently passed most successfully through their specified trials. Further, there had been built, and were building in the district, in addition to several cruisers, many of the fastest torpedo-destroyers in the world, fitted with those water-tube boilers, without which their great speed would have been unattainable on their present dimensions, notwithstanding the undoubted pre-eminence of our naval architects. In addition to the great increase in the number of ships, the fleet had been improved by the types of ships added. The requirements of the executive officers for greater speed and greater offensive and defensive power, without unduly increasing the size of the ships, or in any way reducing their handiness or power of manœuvring, had severely taxed the energies and resources of designers. Working steam pressures and piston speeds had been continuously increased, and weights had been cut down wherever it was possible to do so without reducing efficiency. The deadweight of water carried in boilers of the ordinary type when under steam had for some time been regarded by Admiralty designers as capable of reduction, and as water-tube boilers were more suitable for very high steam pressures than the ordinary type, and also allowed the deadweight of water to be done away with to a great extent and steam to be raised very quickly, the desirability of the introduction of this type of boiler for warships had to be anxiously considered. A powerful Navy was absolutely necessary for the safety of the British Empire, and the action of recent Governments in adding so greatly to the strength of the fleet should be appreciated by every person who was desirous that the prosperity of our glorious empire should be maintained, and who considered that the best way to preserve peace was to be fully prepared for war.

The toast of the evening, "The Institution of Engineers and Shipbuilders in Scotland," was given by Deacon Convener Ramsey. He said that, coming as he did from the operative class of craftsmen, the Trades' House, his sympathies generally were in that line. Endeavouring to lift himself up, however, to the Institution, he said he might say that it was a purely intellectual position. It was an evidence of the advance of cultivation.

Sir William Arrol, in replying to the toast, said he had the honour of presiding in his capacity of President of the Institution, which had now existed 40 years. It was founded by men who were pioneers in engineering and shipbuilding, and attained eminence in their noble professions. Though he came to Glasgow after he had served his apprenticeship he had not the advantage of the Institution. None the less did he desire that it should be useful and keep on a level with the times. The council, he was sure, made this its aim. Great progress had been made during the last 20 years in their respective professions—greater indeed than in any previous period. But he hoped that progress would continue, and in this direction help would be given if all the members strove to make the Institution second to none in the kingdom.

After a considerable number of interesting addresses had been made, Dr. Ebenezer Duncan gave the "Engineering and Shipbuilding Interest," and Mr. John Inglis, in replying, questioned if there existed any body of men who stand more in need of sympathy and encouragement. The art of shipbuilding had attained a very high degree of excellence in this district because of the incessant rivalry among those who carry it on, but unfortunately, and for the same reason, there was not always between the quality of the article produced and its price in the market that correspondence which was the object of their legitimate desire. And between employers and workmen there was not invariably the harmony which might be so advantageous to both, but rather an increasing tendency on the part of the latter to forsake the guidance of those who ought to be their best friends, and to follow the professional organiser.

The toast in memory of James Watt was not missing as it was a year ago, but in proposing it the Chairman followed the example set by his predecessor in office, Mr. John Inglis. Declining any attempt to arouse enthusiasm over "a parallel motion," the "separate condenser," or "an indigestible hash of scraps from a biographical dictionary," he simply gave the toast and allowed the achievements of Watt to speak for themselves. The toast was honoured in solemn silence.

A private meeting of the Clyde Pilot Board was held on January 22nd, in the offices of the Clyde Trust for the purpose of inquiring into the causes of recent mishaps to ships entering and leaving Glasgow Harbour. The meeting commenced at 11 o'clock and lasted for over four hours, several cases of vessels stranding being considered. No information as to the result of the investigation was given, but it is understood that the object of the inquiry was to ascertain if it were possible to make safer the navigation of the river, particularly in the upper reach, and to provide greater facilities for the launching of vessels.

Messrs. Murdoch & Murray, shipbuilders, Port-Glasgow, have received an order to build for passenger and cargo service on the river Amazon, a steel twin-screw steamer, which will be similar in design to several already built by them for this trade. Messrs. Lees, Anderson & Co., Glasgow, will supply two sets of compound surface-condensing engines. Messrs. Murdoch & Murray have also contracted to build a steel screw steamer of 1,650 tons register; the engines, which will be triple expansion, will be supplied by Messrs. Kincaid & Co., Greenock.

Messrs. Robert Duncan & Co., Port-Glasgow, have received an order for a 1,500-tons steamer from Messrs. J. & J. Denholm, of Greenock.

Messrs. Ramage & Ferguson, Limited, Leith, have contracted to build for Mr. William Johnston, shipowner, Liverpool, a steam yacht, of 460 tons, from designs by Mr. St. Clare Byrne.

Messrs. Chambers Brothers, yacht-builders, Greenock, have contracted to build a yacht of 75 ft. keel, for a Glasgow gentleman, the engines will be of the compound surface-condensing type, and to guarantee a speed of 11 knots an hour.

Mr. Thomas Orr, Greenock, has contracted to build for Mr. R. S. Gilmour, engineer and steam yacht agent, Greenock, a 65 ft. steam yacht. He has also an order to build a 25 ft. Daimler motor launch for Mr. Gough, Glenville, Waterford. The piece of ground to the east of Garvel Dock, Mr. Orr has leased, and is to be used as a slip and for yacht storing.

Messrs. A. Rodger & Co., shipbuilders, Port-Glasgow, have sold a 2,800-ton carrying ship, which will be launched about the end of January, to Mr. Ferguson, late with Messrs. Bruce & Co., Dundee.

Mr. Robert Montgomery, Greenock, will supply for a steam yacht being built at Dumbarton, for an Edinburgh gentleman, surface-condensing engines of 110 H.P.

Messrs. Ross & Marshall, Greenock, are erecting an engineering shop on the ground leased by them at Cartsdyke Harbour. They also intend forming a patent slip, to accommodate vessels of the size of the river steamers.

Messrs. J. Hastie & Co., Greenock, have contracted to supply for two vessels, at present being built by Messrs. Stephen, Glasgow, and two steamers building at West Hartlepool, their patent steam-steering gear.

Empress Queen has been the name selected for the new paddle-steamer to be placed on the Liverpool and Douglas Station, now building by the Fairfield Shipbuilding Co., and which was the result of a vote taken by the directors of the Isle of Man Steam Packet Co., among the shareholders.

The paddle-steamer *Paris*, which has been built by Messrs. A. & J. Inglis, Pointhouse, for the Messageries Fluviales del Plata, left the Clyde on January, 18th, for Monte Video. The vessel is intended for passenger service on the River Plate, and internally is as finely fitted and furnished as any boat which ever left the river. She is 300 ft. long, 66 ft. broad over all, 30 ft. deep from the upper deck, and about 2,000 tons gross. Of this type Messrs. Inglis have already built several steamers for the same company; but even in the unsettled regions which Europeans slump as South America, the trend is towards more luxurious surroundings afloat, and it is safe to assume that nothing like the *Paris* has as yet been seen on the Plate. On trial her speed was 16½ knots. The engines are of the triple-expansion three-crank type for paddle boats, of which the firm has built several sets; and neither shipbuilder nor engineer need fear that the record which they hold abroad for this class of work will be depreciated by the *Paris*. The whole of the work has been carried out under the direction of Mr. Thomas Elsee, a partner in the firm of owners, and himself a practical engineer and shipbuilder of much experience.

Torpedo-Boat Destroyers.—The Japanese Government have entered into a contract with Messrs. Yarrow & Co., of Poplar, to construct two torpedo-boat destroyers, having a guaranteed speed of 31 knots.

TRADE NOTES FROM THE TYNE, WEAR TEES, HARTLEPOOLS, &c.

(From our own Correspondent.)

THE TYNE.

Shipbuilding.—Since the advent of the new year, there has been a marked absence of activity in the shipping business, and the somewhat impetuous manner with which shipowners were rushing into heavier responsibilities by the acquisition of new tonnage, seems to have received a check. On the North-east coast, or at all events on that part of it comprising the Tyne and Wear, it has not transpired that any new orders of importance have been negotiated excepting for three Japanese twin-screw passenger steamers and a couple of large pontoons. The trade revival, so far as steamship ordering is concerned, has undoubtedly been short lived, and though practically all the shipbuilding firms are well supplied with work for the time being, it is a matter of doubt whether they will be greatly overburdened with commissions at the end of the year. The ebb and flow of trade which, during the past half century have alternated with the utmost regularity every ten years, have ceased to be noticeable in commercial life, and have given place to a condition of things which is not a little bewildering. To be in accord with the old style, trade, since 1890 or 1891, ought to have been steadily retrograding; but instead of that we have had, in the interval, two or three upward movements, followed almost immediately by changes in the opposite direction. Towards the end of last year there was what everyone recognised as a "boom" in shipbuilding; but now the "boom" appears to have collapsed, and already, manufacturers of plates and angles are beginning to complain of orders falling off. It would appear that in the future, trade fluctuations are likely to be brief and sudden, as in our advanced state of civilisation and scientific attainment, new conditions to influence the course of business are likely to arise with much greater frequency than formerly. The moral of all this is that speculators and investors will have to act with greater circumspection than ever, as the future of trade can never again be gauged with anything like the exactitude that was possible in former years.

One of these continually recurring demarkation disputes has been causing much trouble lately, and has had the effect of retarding, to a very serious extent, the execution of contracts at the Walker yard of Messrs. Armstrong & Co. The dispute, which has been more or less in evidence for some months past, and which culminated in a strike towards the end of December, was between the caulkers (a section of the Boilermakers' and Iron Shipbuilders' Society) and the drillers. The former claimed the work of inserting and finishing tap-bolts, which was being done by the latter. After some negotiations it was mutually agreed to refer the question as to which section should do the work, to the decision of three experts, who were chosen to arbitrate. These gentlemen, after mature deliberation, unanimously gave the work to the drillers, whereupon the caulkers declared that they had been unjustly dealt by, and repudiated the obligation they had willingly incurred. For the accusation that injustice had been done to them there was no ground whatever, beyond the mere fact that the work was given to the rival claimants. The caulkers, as we have stated, struck work; but, after much wrangling and many meetings, and the posting of notices of a look-out by the employers, they were persuaded to return to duty, by the responsible officials of the society. It is very questionable whether they would have reached this stage of tractibility however, had the promise not been held out to them that as soon as they resumed work the officials of the society would "at once take steps to secure the disputed work for their members"—that is to say, to upset the decision of the arbitrators, and to take by force what they could not get by reasonable discussion. The head officials of the Boilermakers' Society are now actually committed to this somewhat equivocal policy, which, we do not hesitate to say, is doomed from the outset to the failure it deserves. The following passage from their address to the members generally, in the monthly report for January, will show their attitude upon the subject:—"When two parties consent to settle a difference by arbitration, it is a most serious matter to break the agreement and repudiate the award. As men who have to uphold the honour and interest of the society, we are bound to uphold the award *for a time.*" The italics are ours; but we think the passage as quoted will present these trade union officials, in no enviable light.

With regard to the general question of work demarcation, we think it is high time the farce of any one section of men claiming the right to debar other capable workmen from doing whatever they are set to do by the foreman, was put an end to. If the man who pays has the right to choose, surely none but the employer has the right to say who shall do the work he has procured, and the wages for doing which he has to pay.

At Messrs. Armstrong & Co's., Elswick yard, work is still accumulating, as more orders have been booked. Every possible expedient is being resorted to, to expediate the fulfilment of contracts, night work being maintained wherever possible, and labour-saving appliances being brought largely into requisition. There appears, however, to be some difficulty in keeping up the necessary supply of labour in one or two departments, a number of men from other centres, who had found employment at the Elswick yard, having recently left in consequence of trade having improved in their own districts. At the Company's Low-Walker yard business is also extremely brisk, the time lost through the caulkers' strike having to be made up.

Messers. Hawthorn, Leslie & Co. have obtained the contract for a thorough overhaul of the hull and machinery of the Russian volunteer steamer *Orel*. The vessel was built by this firm a few years ago, and was, we believe, among the first of the vessels ordered on the Tyne for that service. The vessel—like all the other volunteer boats—has twin engines, which circumstance will of course make the overhaul contract proportionately extensive. In the new work department the firm are also well off for orders, though as the ships in progress are as yet in early stages, the yard is not likely to have a full complement of hands employed for some few weeks.

The statement has been made that Messrs. C. S. Swan & Hunter had definitely taken over the yard adjoining their own premises, which was formerly known as Schlesinger & Davis's, and in reference to which we stated last month that it was taken temporarily by the firm named for the building of a pontoon dock. As the result of enquiries since made we find that the statement referred to is at least premature, and that though it is not outside the range of possibility that the firm may ultimately acquire the property, nothing of a definite character has yet been done to settle the arrangements for permanent occupation.

Messrs. Robert Stephen & Co. have at last secured the contract for the building of a large pontoon dock, to be located at Manilla, in the Philippines, in respect of which the negotiations were commenced more than a year ago. This pontoon will, it is understood, be considerably larger than that to be built by Messrs. Swan & Hunter, and will, when completed, be shipped to its destination in sections. At the yards of Messrs. Wigham Richardson & Co., Messrs. Wm. Dobson & Co., and Messrs. Wood & Skinner, work is plentiful, and practically all berths are occupied. The Palmer Co. have a good deal of merchant work in hand in addition to the war vessels with which their establishment on the north side of the river is exclusively taken up, but notwithstanding this their productive resources do not seem to be utilised to the very fullest extent, as at the Jarrow yard there are one or two berths vacant.

The Tyne Shipbuilding Co. have orders enough to keep the machinery fully going for some months to come, and at Messrs. Readhead's establishment the usual state of briskness is maintained in both the new work and repair departments. At most of the shipbuilding establishments that are devoted to the building of fishing vessels and other small craft, business is brisk, and at all the graving docks repair contracts—generally of an important kind—are in progress. The repairing establishments of Messrs. Edwards and the Smith's Dock Co. are particularly busy, the pontoon docks of the latter firm being very frequently in requisition.

The building of ships' boats is still slack, though some slight improvement as compared with last month may be noted.

Engineering.—The activity in the marine engine works of the Tyne is fully maintained, and in some instances new contracts have been booked. Among the new commissions negotiated may be mentioned the building of the duplicate engines for a large passenger steamer, to be built by Messrs. C. S. Swan & Hunter to the order of a Japanese syndicate. This order, which is an exceptionally important one, as the engines have to develop a speed of over 17 knots, has been secured by the Wallsend Slipway and Engineering Co., whose reputation for the production of high-class work has been long established.

The works of the North-Eastern Engineering Co., Wallsend, continue extremely busy, and most of the departments are on night shift. The s.s. *Milwaukee*, a cargo boat of the very largest class, which was built by Messrs. Swan & Hunter for Messrs. Elder, Dempster & Co., Liverpool, was recently engined at these works, and in a marvellously short time considering the great size of the machinery and boilers. The trial of the machinery, &c., which took place on the 16th inst., was in all respects eminently successful.

Messrs. Clarke, Chapman & Co. have commenced to utilize the works recently acquired from Messrs. Black, Hawthorn & Co. by the transference from the Victoria Works of a portion of their deck accessory trade. It is expected that before the year is far advanced the recently acquired works will be in full operation. There is generally a good supply of work at the local forges, and both iron and brass foundries are busy.

The works of Messrs. John Spencer & Sons at Newburn and Newcastle are in full operation throughout, and this bids fair to be a record year with the firm in the matter of output. The Jarrow steel works are in full operation, and are showing excellent results. Orders are plentiful, and pressure for delivery so urgent that all possible time has to be worked.

THE WEAR.

Shipbuilding.—Messrs. Doxford have made another new departure which redounnds greatly to their credit, and cannot fail to strengthen the feeling of friendliness between themselves and their workmen, which has long been a theme for local comment. This time the new departure is a treat of quite a novel character to the whole of their employes, including a proportion of the latter's friends in appreciation of the aid afforded the firm by steadiness and attention to work in producing a record output last year. The whole of the seating accommodation in the principal local theatre was taken by the firm for two nights, and the employés with their friends were invited to witness the performance as guests of the firm. This is a very graceful way of showing appreciation of service rendered, over and above the mere wages equivalent, and it would do much to foster a kindlier feeling between employés and employed if it were largely followed. The most recent order booked by the firm is, we understand, a 6,000-ton passenger steamer for Messrs. Sutherland, of Newcastle. Mr. Laing, the well-known Sunderland shipbuilder, has received the honour of knighthood since the opening of the year, and everyone will say that it is a tribute of respect which he fully deserves. At the establishment under his control, two Japanese passenger steamers have been ordered by the same owners who have ordered one from Messrs. Swan & Hunter, of Wallsend. The vessels will be of large size and elaborate equipment, and their construction will add greatly to the briskness of the yard during the spring and summer months.

Heavy deliveries of material are just now being made at the yard of Messrs. J. L. Thompson & Sons, North Sands, and everything points to the likelihood of the present year being an exceptionally busy one with that firm. Among the five large vessels on the stocks, at least two are for foreign owners, and one of them is to be engined by Messrs. Blair, of Stockton.

Messrs. Short Brothers had their first launch for the year on the 20th inst., the vessel being an exceptionally large one, built to the order of local owners. The firm are very busy, and are keeping the frame-turners, &c., on night shift. At Messrs. Priestman & Co.'s yard there is a large amount of work in progress, and the state of affairs at Messrs. Pickersgill's is much improved since last year. Messrs. Robert Thompson & Son's yard is also showing signs of greater briskness. The Sunderland Shipbuilding Co. have commenced the construction of a French passenger boat, and it is reported that other orders for vessels of a superior class have been secured. Messrs. Bartram & Sons have commenced frame turning for another large vessel, in addition to the two that are on the stocks, and overtime is being worked nightly in some of the departments. At Messrs. Blumer & Co.'s and Messrs. Austin & Sons, work is also abundant, the latter firm being especially busy in the repair line.

Engineering.—The order for the machinery and boilers of the two Japanese passenger steamers to be built at the Deptford yard, has been given to Messrs. George Clark, Limited, of the Southwick Engine Works, whose capability for dealing with work of a special class is well known. Most of the vessels engined by them last year were passenger vessels, and in every case the results achieved on trials and in actual work were most satisfactory to the owners.

The North Eastern Engineering Co., South Dock, are also understood to have booked new orders, and they are undoubtedly at this moment well supplied with work. At Messrs. Doxford's establishment the state of business is also satisfactory, and the same may be said respecting other marine engine works on the river.

Business continues brisk at the Sunderland Forge and Engineering Co.'s works, the state of affairs in the electrical department being particularly satisfactory. At most of the other establishments where ship and engine forgings are made, orders are fairly numerous.

Makers of steam steering gears, steam winches, and other deck accessories, are enabled to keep their machinery in full operation; while foundries, coppersmith's shops, and brass works, are as busy as possible. The Monkwearmouth Iron Works are now running full time, and the production of angles, flat bars, &c., is probably greater than at any former time. Ships' plumbers, are, and have been for some time past, exceptionally busy.

The Hartlepools.—The shipbuilding yards are all showing indications of rapidly improving business; but, as many vessels are yet in early stages of construction, employment for labour is not so plentiful as could be wished. The difficulty of getting delivery of material from the rolling mills also tends to retard progress, and to further postpone the time when fuller employment for both mechanics and labourers will be available. At the Hartlepool Engine Works (Messrs. Thos. Richardson & Sons) business is still active. The trial of the s.s. *Cambrian*, took place from the Central Marine Works towards the end of the year, and proved in every way satisfactory. The vessel is by far the largest yet built and engined at the Hartlepools, being 464 ft. long, and having a measurement capacity of 10,000 tons. Howden's forced draught arrangement is fitted to the boilers, which are three in number, and are built to work at a pressure of 185 lbs. per square inch. The vessel will have a speed of 14 knots.

Stockton.—All three shipyards at this centre are now in full work, a strike which had existed at one of them having been settled. Messrs. Blair & Co. continue to have their shops very full of work, and at Messrs. Rogers, and other engineering establishments, business is brisk. Steel and iron works are kept briskly going, the large works of the Stockton Malleable Co. being more than usually well employed.

Middlesbro.'—Bridge shops at this centre are fully employed and enquiries are still being received. Boiler-shops are also exceedingly busy, one firm having recently booked orders for 50 boilers. Engineering works are still quite busy, and in the local shipbuilding yards the outlook for the year is satisfactory.

Blyth.—It is reported that the Blyth Shipbuilding Co. have booked an order for a vessel of a superior class.

THE MERSEY.

(*From our own Correspondent.*)

THE position as regards the shipbuilding, marine, and general engineering industries of this district continues very satisfactory. In the shipbuilding trade, notwithstanding a slight slackening off as regards new orders coming forward the yards generally have plenty of work to keep them fully employed. As to the marine and general engineering industries, exceptional activity is the report in practically all departments, the leading firms being, in many cases, so full of orders that they are unable to entertain new work for delivery until well towards the close of the year. Machine tool-makers especially are exceptionally busy, on orders both for marine and general requirements, which ensure full employment over the next twelve months. Locomotive builders are in much the same position, and one firm, which has just booked an order for twenty-four locomotives for the Indian State railways, does not anticipate being able to start upon these during the present year. Stationary engine builders are also well engaged on orders both for home and abroad, and boiler-makers are exceedingly busy; in fact the only direction in which the present general activity is not being felt, is in some of the cotton machine making departments, where there has been a slackening off in the weight of new work coming forward as a result, no doubt, of the present depressed condition of the textile trades of Lancashire.

The usual monthly returns of the principal engineering trades unions continue very satisfactory. The Amalgamated Society of Engineers reports about 3 per cent. on donation, but this includes, in many cases, members suspended in connection with the holiday stoppages of work, apart from which the percentage is about the same as last month. For this immediate district, any really reliable returns are scarcely possible, owing to the holiday stoppages, and the dispute in the spindle and fly making trade, which is causing a number of the society's members to be thrown on the books. The Steam Engine Maker's Society has not more than ¾ per cent of its membership on donation. Reports as to the state of trade continue very favourable, and during the month advances in wages have been secured at Ashton, Newton-le-Willows, and Stockport.

The two trade unions above-named are also making exceptional progress as regards membership and finance. The Amalgamated Society of Engineers has now 87,455 members, representing an increase on the year of 8,321—the largest that has ever been recorded in any one year of the society's existence. The capital of the organization now stands at something like £300,000, representing about £3 2s. 6d. per member, no less than £67,000 having been added to the funds during the past year. Substantial progress has also been made as regards the eight hours' day, which is now being worked by about 25 per cent. of the society's members. The Steam Engine Makers' Society shows an increase of about 1,000 members, the number on the roll being now over 8,000, whilst it is expected that when the annual report is issued, the increase in funds will be larger than in any previous year.

During the past month the *Ulster*, the first of the mail steamers built by Messrs. Laird Bros. for the Dublin Steam Packet Co., went through a trial on the Clyde, making a mean speed of 23·3 knots in four runs on the Skelmorlie mile. The trial was in every way successful, and it may be added that in her passage from Liverpool the vessel proved herself an excellent sea-boat in the strong gale that was blowing. A few days after the trial of the *Ulster*, the final full-power speed trial of the torpedo gunboat destroyer *Thrasher* was taken, with the remarkable result that a mean speed of 30·34 knots was obtained. This trial concluded a successful series of trials of the first set of four destroyers which Messrs. Laird have in hand for the British Navy. It is also interesting to note that the *Thrasher* has proved itself to be one of the nine fastest vessels in the world, eight of which have been built by Messrs. Laird, the other seven being the *Quail*, *Sparrowhawk*, *Virago*, for H.M. Navy, and the *Capitan Munoz Gamero*, *Capitan Orella*, *Teniente Serrano*, and *Guardia Marina Riquelme*, for the Chilian Navy. During the month Messrs. Laird have also successfully launched the *Panther*, which is the eighth of the destroyers they have built for the British Government, and the twelfth 30-knot vessel of this class which the firm have turned out.

The steady development of engineering industry in Manchester and Salford is gradually compelling the leading firms to seek outside the town and city boundaries cheaper and more commodious sites on which to erect enlarged and more modern works, and one of the oldest engineering firms in Salford, Messrs. Kendall & Gent, is now removing to the Gorton district for the purposes of extension. With this object four acres of land have been purchased adjoining the Belle Vue station of the Sheffield and Midland Railway, which will be connected by a siding to the new works. These will be fitted up on the most modern lines, one special feature, which will be quite a novelty in this district, being the adoption of electric driving throughout. At their Salford Works the firm employ from 250 to 300 men, but the new works are being laid out to give employment to about double this number of hands. The firm has a wide reputation both at home and abroad for its high-class machine tools for marine, locomotive, and general engineering work, and its present head, Mr. Samuel Dixon, is well known amongst engineers of the district, having been President of the Manchester Association in 1888-9.

Another important incident in connection with the engineering trades of the district is the amalgamation of the well-known firm of Sir Joseph Whitworth & Co. with Sir William Armstrong & Co., of Elswick, under the style of Sir William Armstrong, Whitworth & Co.

A very ingeniously-designed machine is being placed upon the market by the Ductor Machine Co., for whom Messrs. H. Wallwork & Co., Manchester, are the sole makers, for the combined processes of nail-making and box-nailing. The nails are cut from a continuous reel of wire, formed into the shape of a staple, and driven into the sides of the box by a series of successive and practically simultaneous operations. The wire is fed into the machine by feed rolls, and cut by tools to the desired length. The nails or staples are shaped by bending tools and anvils, and driven into the boxes by means of hammers or drivers. Every process of the machine is automatic, and no rubber or metal tubes are required to guide the nails to their places for nailing, whilst the working of the machine is so simple that any boy or girl can be trained to manipulate it. The "Ductor" can, if required, be used simply as a staple-making machine, the one we saw being capable of making 30,000 to 40,000 staples per hour. The invention is Williams & Evans' patent, and certainly marks a decided advance in the manufacture of boxes with as little hand labour as possible.

Messrs. Browett & Lindley, of Patricroft, have recently completed a specially-designed independent surface-condensing plant for the Croydon Electric Light Station, constructed to condense 11,000 lbs. of steam per hour, with a tube surface of 800 square feet. A pair of vertical single-acting air and circulating pumps are mounted on a cast-iron base plate extended to carry the engine, and the buckets are worked by links attached to an overhead beam. The surface-condenser is carried on two feet, and placed alongside the pumping plant, and the engine is one of the firm's tandem compound E. L. type. The cylinders are 5½ in. and 9½ in. diameter by 8 in. stroke, the air-pump 10 in. diameter, with 10 in. stroke. and the circulating pump 19 in. diameter with 10 in. stroke. The buckets are of gun-metal, with large ports for the passage of air and water, and are fitted with india-rubber valves and brass guards. A 12 in. dial vacuum gauge is fitted on the condensing chamber in a convenient position.

In the iron trade a continued exceedingly strong tone is reported generally, with a fair weight of business coming forward. Pig-iron is in steady demand, and in most brands, makers have further advanced their prices during the past month, whilst they are generally so well booked that they are very cautious about committing themselves to forward engagements. Local brands are without quotable change, but very firm at 48s. 6d. less 2½ for foundry qualities, delivered Manchester. Lincolnshire makers are practically out of the market, as they have little or nothing to offer, except to their regular customers, and their quotations are scarcely more than nominal at about 6d. above last month's rates, 47s. 6d. net cash delivered Manchester, representing about the average figure. Derbyshire foundry brands have been advanced 1s. to 2s. per ton, 50s. 6d. to 52s. net being now quoted for good qualities, delivered here Forge descriptions are also stronger, and Lancashire is now quoted at 46s. 6d., less 2½, with Lincolnshire, 46s. net cash, delivered Warrington. In outside brands Middlesbrough has advanced 1s. to 1s. 6d. per ton, makers quoting 50s. 10d. net, for good named brands delivered by rail here, with ordinary truck iron scarcely obtainable under 50s. 3d. Scotch iron has shown no material change, 52s. 3d. to 52s. 6d. net prompt cash, being still the average figures for Eglinton and Glengarnock, delivered Manchester Docks. There is practically just now no Middlesbrough iron at the Manchester Docks, but supplies of American pig-iron have recently been landed, and for this about 47s. 6d. to 48s. net has been quoted.

Manufactured iron makers report more business offering than they care to entertain, as they have already orders on their books to carry them well over the first half of the year. They have, however, made no alteration in their quoted rates, but are very firm at £6 as the minimum for Lancashire bars, and £6 5s. for North Staffordshire qualities delivered here. Sheets remain at about £7 7s. 6d. to £7 10s. and hoops £6 10s. for random to £6 15s. for special cut lengths delivered Manchester district and 2s. 6d. less for shipment.

In the steel trade prices, on most descriptions, have shown a strong upward move. Hematites have been in active request, considerable sales having been made during the month, and makers are asking about 2s. to 2s. 6d. above the rates ruling last month, 61s. to 62s. 6d., less 2½ being now the average figures for delivery here. Local made billets are kept low owing to the competition of American qualities, and Lancashire makers find it difficult to get more than £4 15s. net delivered Warrington district. Bars have shown a substantial advance, and are now quoted £6 5s., whilst boiler plates are also hardening in price, and although Scotch qualities could still be bought at £6 10s. to £6 12s. 6d., with local makers prepared for immediate delivery to sell at £6 15s., they are asking £7 on forward contracts delivered here.

Business in the metal market continues active, makers being kept fully going, and the recent hardening tendency in prices has resulted in a general advance in list rates of ¼d. to ½d. per lb. Official quotations, delivered Manchester district, are now as under.—Solid-drawn brass boiler tubes, 7¼d.; brass surface condenser tubes, 8¾d.: copper tubes, 8¾d.; brazed copper, gas and steam tube, 8½d.; brazed brass gas tube, 8¼d.; brass wire, 6½d.; copper wire 7½d., rolled brass, 6½d. per lb.

A steady business is reported in the timber trade, with no change in prices. Imports have been moderate, and deliveries satisfactory, whilst stocks, although sufficient, are not too heavy. East India teak is in fair demand, and prices show some improvement. Only one cargo of Greenheart has arrived and stocks are moderate, with the values well-maintained.

The position in the coal trade has shown no material change. Pits, since the restart after the holidays, have been kept going full time with orders in hand, and, in some cases, collieries have had to fill up out of stock to meet requirements of customers. House coals are in fairly active request, with prices steady at about 10s. 6d. to 11s. for best Wigan Arley, 8s. 6d. to 9s. for Pemberton four foot and seconds Arley, and 7s. to 7s. 6d. for common house coal, at the pitmouth. Steam and forge coals meet with a steady demand at full late rates, ordinary qualities averaging 6s. 6d. at the pit. Engine fuel is more plentiful, and surplus supplies are pushed for immediate clearance at under full current rates, but for forward delivery colliery representatives are very firm at recent quotations, averaging 3s. to 3s. 6d. for common slack, 3s. 9d. to 4s. 3d. for medium sorts, and 4s. 6d. to 5s. for best qualities, at the pitmouth.

The shipping trade has been active, with prices well maintained, good qualities of steam coal fetching 7s. 9d. to 8s., delivered Mersey ports, and about 8s. to 8s. 3d. delivered High Level, Liverpool.

BELFAST TRADE NOTES.

(*From our own Correspondent.*)

UP to the time of writing these Notes only one vessel has left the stocks during the month. This is a large twin-screw steamer named the *Delphic*, and is the latest addition to the well-known fleet of White Star steamers. Her principal dimensions are:—Length, 475 ft.; beam, 55 ft.; with a gross tonnage of about 9,000 tons, and she will be employed in the New Zealand trade along with other vessels of the White Star and Shaw Savill & Albion Line, sailing regularly from Plymouth, calling at Teneriffe and Hobart outwards, and Rio de Janeiro and Teneriffe homewards. The distance traversed on each voyage exceeds 26,000 miles, but the new vessel, like the *Gothic*, will be fitted with two sets of triple-expansion engines and twin screws, thus affording an additional element of safety. In addition to ordinary coal and cargo space, the *Delphic* will be fitted with two large refrigerating machines on the dry-air system, and there will be a total refrigerated space, in three holds, of about 285,000 cubic feet, or equal to about 100,000 carcases of sheep. This vessel was launched from the northern end of Messrs. Harland & Wolff's yard.

Early in the month the operation of pulling apart the two halves of the s.s. *Augusta Victoria* was successfully accomplished by the same firm. A similar plan was adopted in the case of the Union boat *Scot*, last year. After having two of her three funnels and one of her masts removed, the vessel was placed in the Alexandra dry dock and properly shored up. A cradle was then built under the fore part of the vessel and a section made through her by cutting out the necessary plates and rivets. Launch-ways were then placed under the cradle with stoppers fixed on them at the proper distance apart, namely, 61 ft. Strong cables were then attached to the hull and led to powerful winches at the side of the dock, and by this means the bow part was drawn the necessary distance apart. The operation occupied considerably longer than in the case of the *Scot*, owing to some trouble with the butt straps. The work of joining up is already well in hand. A large number of representatives from the Hamburg-American Co. were present on the scene.

The s.s. *Pennsylvania*, which enjoys the distinction of being the largest vessel afloat, is now almost completed and is expected to sail about the end of January. Work on the other two boats for the same company, namely, the *Arcadia* and *Arabia*, is progressing rapidly.

Messrs. Workman, Clark & Co. have launched no vessels up to date this month, but at present have three large steamers awaiting machinery. It is expected that the *Kamakura Maru*, the engines of which are being built by Barclay, Curle & Co., Glasgow, will leave for the Clyde early in February.

The s.s. *Hidalgo*, recently completed by this firm for New York owners, ran a most successful trial trip in the Lough, and proceeded direct to Vera Cruz.

NORTH-WEST OF ENGLAND.

(*From our own Correspondent.*)

Barrow.—There is not much that is new to report of the shipbuilding trade of this district since the dawn of the New Year. Certainly no new orders have been booked, and the demand for new tonnage is reported not to be quite so active as of late. There are, however, some good enquiries to hand, and these are receiving attention. Makers in the meantime are very busy on the orders already in hand, but there is now room in the yard for putting down several new keels, and new orders will soon be wanted to maintain the present activity. Naturally attention in this regard is directed to the new proprietorship of the Barrow Yard, Messrs. Vickers, Son & Co., Limited, as it is known to be their intention not only to build ships to order for clients requiring every type of tonnage, but to build warships of all classes, of modern design and equipment, open to be purchased by any Power in need of additions to its fleet. The future has doubtless much in store for Barrow in this respect, as it is known that considerable developments are contemplated with a view to perfecting warships of all sorts completely from the local and Sheffield resources of the builders. No definite steps have yet been taken in this matter, but consideration is being attentively devoted to the prospective programme of work to be undertaken and carried out. In the meantime the shareholders and Vickers, Son & Co. have approved of the scheme of purchasing the Barrow Yard, and the shareholders of the Naval Construction and Armaments Co. will at an early date be called together to sanction the sale. No difficulty in this respect is likely to ensue because the terms are so satisfactory and the prospects for Barrow are so good.

During the month the twin-screw steamer *Duchess of Devonshire*, built for the Barrow Steam Navigation Co., and intended for the Barrow, Isle of Man, and Belfast services, has been launched. The occasion was of all the greater importance because the vessel was christened by the Duchess of Devonshire herself. Her Grace was presented with a beautiful model of the ship as a souvenir of the occasion, and it is her intention to place this model in a conspicuous position among the many treasures which adorn Chatsworth. The new steamer is to have a speed of 19 knots, and will thus be able to run from Barrow to the Isle of Man in two and a-half hours, and will also be able to reduce the time occupied in running from Barrow to Belfast by from one to two hours. Faster boats on the Barrow channel services will lead to the increased popularity of the Barrow route, and it is hoped and believed in this respect that the *Duchess of Devonshire* will be the forerunner of other even faster steamers in the near future. It is interesting to note the fastest channel steamer afloat at present is the *Duke of Lancaster*, built at Barrow by the Fleetwood Co., running 18 knots easily. The *Duchess of Devonshire* will go one more, and the two Great Western steamers now building at Barrow for the Channel Island service will steam 20 knots. There is always a progression noticeable in speeds when new orders are given out, and there is at present apparently no finality in these matters. The Barrow Co., along with other companies, is preparing a tender for an even faster Fleetwood steamer, and then it is hoped the Barrow Co. will come forward for one better. Thus competition greases the wheels of trade.

Arrangements have been completed for launching H.M.S. *Niobe*, first-class cruiser, on the 20th of February. Lady Harris wife of the chairman of the N. C. & A. Co., will christen the ship, and the occasion is likely to be one of considerable importance. The *Niobe* has been built on the ways where the *Powerful* was built. Alongside of her the frames of a sister first-class cruiser, the *Amphitrite*, are being raised, and by the end of the year she will be almost ready for launching. The preliminary trial of the *Avon*, torpedo-boat destroyer, a 30-knotter, have taken place with great success. Those of the *Bittern* are likely to follow, and during the year the *Otter* and *Leopard*, all 30-knotters, are expected to be through, and to attain the high speeds contracted for.

The *Clan Sinclair*, which has been tripled and modernised for the Clan line, is almost ready for delivery, and her owners want her at the earliest moment. The work of tripling three other Clan Liners is proceeding in the engineering department of the shipyard, but it will probably be the autumn before the ships come round to Barrow for the necessary alterations.

Mr. W. Charlton.—At the beginning of January Mr. W. Charlton, who for many years was secretary of the Barrow Shipbuilding Co., and who during the past nine years has been works secretary for the Naval Construction and Armaments Co., retired from the service of the Barrow Co. The occasion was taken advantage of to make Mr. Charlton a testimonial as a recognition of the great esteem in which he is held. A beautifully illuminated address was presented to him, together with a cheque for three hundred guineas, and expressions of the hope that the rest of his life would be spent happily in well-earned retirement. Mr. Charlton years ago was secretary of Palmer's Co., and was also connected with Messrs. Hawthorn, Leslie & Co., on the Tyne. He is very well known in the shipbuilding world.

The annual supper, concert and ball in connection with officials of the Naval Construction and Armaments Co. was held on Friday, the 22nd January, in the Drill Hall, Barrow. Upwards of 600 partook of supper, and a very enjoyable evening was spent. Mr. Adamson, the managing director, said that the work to be accomplished by the company in 1897 would be as great as in any year for some time past.

The relations between employers and employed at Barrow remain very satisfactory, and it is hoped that where any difficulties are likely to arise amicable means will be found for a satisfactory settlement.

Whitehaven.—Up to the present time no success has attended the attempts made for years past to re-establish a shipbuilding trade at Whitehaven, and it is beginning to be evident there will be no resuscitation of the shipbuilding industry, which at one time was one of the leading trades of Whitehaven. This is a matter of regret, in view of the success which has for years attended the two shipbuilding yards at Workington and Maryport, which are managed by gentlemen who know the trade intimately, and are in a position to maintain regular activity year in and year out in the small class of tonnage which is here built. What Whitehaven wants is not so much local men to find the requisite capital to re-start the yard, but good, practical shipbuilders of commercial ability who, by acquiring the yard cheaply, which could be done, could commence an unambitious scheme which would ultimately lead to future development and extension.

Workington and Maryport.—General and steady activity characterises the shipbuilding trade at Workington and Maryport. Both at Messrs. Williamson's and Messrs. Ritson's yards a considerable amount of small tonnage is in progress of construction, and a continuity of orders is looked forward to as soon as the work already in hand has approached nearer to completion. Although the shipbuilding trade of this district is confined to small craft, it has the merit of being generally busy whether trade throughout the country is so or not.

Shipbuilding Material.—The trade in all qualities of shipbuilding material is very steadily maintained. The demand for ship plates and boiler plates remains very strong and active, and the orders booked some time ago by shipbuilders have led to the placing of orders well ahead for future delivery. Makers are, in fact, very fully sold forward, both as regards heavy and light plates, and the market is still brisk. At present local works do not do much, if anything, in the production of angles and sections generally, as works with special appliances for cheap production in other parts of the country can command the trade. Developments in this direction may, however, be expected on the west coast, as not only are there evidences of new life at Barrow but in West Cumberland as well. A scheme is being promoted whereby a new syndicate anticipates the taking over of the West Cumberland Steel Works at Workington, which have stood idle for some years. The plant at these works is obsolete, and the intention of the prospective new proprietors is to put down a new and modern plant which will embrace not only the Bessemer but the Siemens-Martin departments, and mills for steel rail manufacture as well as others for the production of plates and shipbuilding material generally. A very active business is being done in steel castings, and particularly for heavy castings for shipbuilding and engineering work, and the prospects are that this work will grow to a large extent in the early future, and with the necessity of fuller production, large extensions of foundry accommodation and facilities may be looked forward to.

The Hematite Trade.—The active condition of the hematite pig-iron trade when the year opened has been fully maintained, and prospects are improving every day. The demand has lately been greater than the supply, and particularly so for forward deliveries. Prices have been well maintained all round, and although warrant iron has fluctuated somewhat business generally has been done at good prices, ranging from 51s. 2d. to 51s. 8d. Makers, on the other hand, have held firmly to the quotations with which they opened the New Year, viz., 51s. 6d. to 52s. 6d. net, f.o.b., for mixed Bessemer nos. Stocks show a slight increase on the month. There are still 36 furnaces in blast, but this number is about to be increased gradually, as fuller supplies are to hand of native iron ore. For some months past there has been a great scarcity in the delivery of native ores, owing to the fact that raisers have for years past experienced so small a trade that attention was not directed to the discovery of new finds, with the result that at present the local output of raw material has to be supplemented with supplies drawn from Spain and elsewhere.

Shipping.—The shipping trade has not been very busy since the New Year came in, but the quietness shown is only of a temporary nature. The shipments of pig-iron have reached 21,341 tons, and of steel 36,627 tons, as compared with 20,186 tons of pig-iron, and 25,830 tons of steel in the corresponding period of last year, an increase of 1,155 tons of pig-iron and 10,797 tons of steel.

The Lengthening of the "Augusta Victoria."—This well-known steamer, owned by the Hamburg-American Steamship Co., and which was sent to Belfast to be lengthened by Messrs. Harland & Wolff, Limited, was successfully bisected on Saturday forenoon, January 9th, in the Alexandria Graving Dock, Queen's Road. There were present several hundred spectators, in addition to the managers and foremen of the various departments, Mr. G. W. Wolff, M.P., was also present. The Hamburg-American Steam Packet Co. own a number of remarkably fast and palatial mail steamers, and the firm determined to entrust the lengthening of the *Augusta Victoria* to Messrs. Harland & Wolff, who have lately been commissioned to build the *Pennsylvania* and other large steamers for the same firm. The *Augusta Victoria's* plates amidships were finally separated on Friday, January 8th, and the preliminary operations of lengthening the ship between 60 and 70 ft. were begun at ten o'clock on Saturday morning. The *modus operandi* was to draw the fore part of the vessel forward a distance of 64 ft. from the stern half. The part to be moved was fixed in a cradle, running on greased ways, and heavy chains, attached to wire and hempen ropes, were hooked to the hull abaft the stem. On each side of the graving dock were two powerful steam winches, held in position by lashings and steadied with a heavy pile of pig iron. A large number of workmen were employed in the operation, but at ten o'clock sharp, as the foreman gave the signal for the haulage to begin, one of the chains snapped, and some time was occupied in readjusting the gear. After this hitch had been overcome the shackle of a wire rope block gave way, and when this had been remedied the signal was again given to start. The fore part of the vessel was then put in motion, and in somewhat less than seven minutes a deadweight of between six and seven thousand tons was drawn the required distance. The power for the steam winches was obtained from one of the boilers of the pumping apparatus connected with the graving dock, and conveyed to the machines by a steampipe [illegible] the purpose.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Ostero.—On December 3rd an iron steam ketch of about 140 tons register, named the *Ostero*, was launched at North Shields for the White Star Steam Fishing Co., Limited, Grimsby.

Norah.—On December 4th a steel barge, for being towed, of 250 gross tonnage, named the *Norah*, was launched at Middlesbrough for Mr. J. Constant, of London.

Mary.—On December 4th a steel barge, for being towed, of 250 gross tonnage, named the *Mary*, was launched at Middlesbrough for Mr. J. Constant, of London.

Ayr.—On December 7th an iron smack-rigged steamer, of 118 gross tonnage, named the *Ayr*, was launched at South Shields for the Ayr Harbour Commissioners, Ayr.

City of London.—On December 15th a steel steam ketch of about 190 tons gross, named the *City of London*, was launched at Newcastle for Messrs. Hagerup, Doughty & Co., Grimsby.

Svino.—On December 17th a steel steam ketch of about 140 tons gross, named the *Svino*, was launched at North Shields for the White Star Steam Fishing Co., Limited, Grimsby.

City of Lincoln.—On December 19th a steel steam ketch of about 190 tons gross, named the *City of Lincoln*, was launched at Newcastle for Messrs. Fagerup, Doughty & Co., Grimsby.

Harrier.—On December 21st an iron steam ketch, of about 160 tons gross, named the *Harrier*, was launched at Hull for Messrs. Pickering & Haldane, Hull.

Elsie.—On December 21st a steel barge, for being towed, of about 250 tons gross, named the *Elsie*, was launched at Middlesbrough for Mr. J. Constant, of London.

Landana.—On Monday, December 21st, Sir Raylton Dixon & Co. launched from their Cleveland dockyard, Middlesbro', a fine steel screw cargo steamer, built to the order of Messrs. Elder, Dempster & Co. of Liverpool. Her principal dimensions are:—321 ft. by 44 ft. by 26 ft., moulded, and she is built to the highest class spar-deck rule, with a large deadweight carrying capacity on a light draught of water. The spar-deck is of iron, with poop, bridge and four decks of pitch pine. She is fitted with six steam winches, five bulkheads, plate keel and bilge keel. The accommodation for captain, officers, engineers, is in a house on bridge-deck, crew in topgallant forecastle. Triple-expansion engines will be fitted by Messrs. The North Eastern Marine Engineering Co., Limited, Wallsend, having cylinders 23 in., 36 in., 59 in., by 42 in. stroke, with two large boilers working at 160 lbs. pressure. On leaving the ways the vessel was named *Landana* by Mrs. Leach, of Liverpool.

Vanilla.—On December 21st there was launched by Messrs. Cochrane & Cooper, at Grovehill, Beverley, a new steam trawler, built to the order of the Arctic Steam Fishing Co., Limited, Grimsby, of the following dimensions, viz.:—100 ft. by 20 ft. 6 in., by 11 ft. depth of hold, and fitted with 45 N.H.P. triple-expansion engines by Messrs. C. D. Holmes & Co., of Hull. She was christened the *Vanilla*.

Oakby.—On December 21st Messrs. Ropner & Son, of Stockon-on-Tees, launched for a West Hartlepool firm a steel screw steamer of the following dimensions, viz.:—Length between perpendiculars, 275 ft.; breadth, 39 ft. 7 in.; moulded depth, 17 ft. 6 in. She is built off the part awning-decked rule, having poop and raised quarter-deck, her deadweight carrying capacity being 2,680 tons on 16½ ft. She is built with deep frames, leaving the holds entirely clear for cargo, and carries her water ballast in a cellular bottom and in the after peak. All labour-saving appliances are fitted for the economical working of the steamer, and also for the expeditious loading and unloading of cargoes. She has steam steering gear amidships, and steering gear aft, four powerful steam winches, two large donkey-boilers, patent windlass, stockless anchors, &c. The engines will work up to about 700 effective H.P., and are by Messrs. Blair & Co., Limited, having cylinders 17½ in., 29½ in., and 50 in., by 36-in. stroke, steam being supplied by two steel boilers working at 210 lbs. pressure. The steamer was named *Oakby* by Miss Ropner, of Preston Hall.

Edith.—On December 21st a steel barge, named the *Edith*, for being towed, of about 250 tons gross, was launched at Middlesbrough for Mr. J. Constant, of London.

La Mouette.—On December 21st Messrs. Cochrane & Cooper launched at Grovehill, Beverley, to the order of the Société Anonyme Pour la Peche a la Vapeur, Dunkirk, the steamer *La Mouette*. She is 105 ft. by 21 ft. by 11 ft. 2 in., and is to be fitted with 50 N.H.P. triple-expansion engines by Messrs. Amos & Smith, Hull.

Verona. — On December 21st Messrs. Short Brothers launched from their yard at Pallion, Sunderland, a very handsomely-modelled steel screw steamer, to the order of Messrs. Gow, Harrison & Co., of Glasgow. She is of the following dimensions, viz.:—Length between perpendiculars, 352 ft.; breadth, 45 ft.; and depth moulded, 27·9 ft., and has been constructed of Siemens-Martin steel to the highest class in the British Corporation. She has an open poop, long bridge amidships, on top of which houses have been erected for the saloon and cabin accommodation, captain, officers, and engineers, with wheel and chart-house on flying bridge, and the crew are berthed in the topgallant forecastle, which is very commodious. The double bottom fore and aft, which provides ample water ballast, is divided for trimming purposes; there are six steel bulkheads with four cargo holds, having in all eight powerful steam winches for the rapid loading and discharging of cargoes, steam being supplied for driving the winches by a very large multitubular donkey boiler placed in the stokehold. The steering gear is placed in the engine-room, with controlling rods to wheel-house on flying bridge. The vessel is to be fitted with triple-expansion engines by Messrs. Thomas Richardson & Sons, Limited, of Hartlepool, having cylinders 24 in., 39 in., and 66 in. respectively, with a stroke of 42 in., steam being supplied at 180 lbs. working pressure by two large steel boilers fitted with Howden's system of forced draught, with all the latest appliances in marine engineering. During construction the vessel and engines have been under the supervision of Mr. George M'Farlane, of Glasgow, on behalf of the owners. On leaving the ways the vessel was named *Verona*, the ceremony being performed by Miss Short, of Ashbrooke Hall.

Osborne.—On December 22nd Messrs. Cochrane & Cooper launched at Grovehill, Beverley, a steamer for Grimsby owners of the following dimensions, viz.:—93 ft. 6 in. by 20 ft. 6 in., by 10 ft. 8 in. depth of hold, and is fitted with 40 N.H.P. triple-expansion engines by Messrs. C. D. Holmes & Co. The vessel was named *Osborne*.

Wilberforce.—On December 24th an iron steam ketch, of 162 tons gross, named the *Wilberforce*, was launched at Hull for Messrs. Spring & Horner, Hull.

Maud Cassel.—On December 26th Messrs. W. Doxford & Sons, Limited, launched from their shipbuilding yard at Pallion, Sunderland, to the order of Messrs. W. H. Muller & Co., of Rotterdam, the new steamer *Maud Cassel*, a turret-type vessel, of a deadweight carrying capacity of 6,000 tons.

Harald Haarfagre.—On January 5th Sir W. G. Armstrong & Co. launched, at Walker on the Tyne, the Royal Norwegian armour-clad *Harald Haarfagre*. She was designed by Mr. Watts, and the principal dimensions are:—Length, 280 ft.; breadth, 48 ft. 6 in.; draught, 16 ft. 6 in.: displacement, 3,500 tons. Her armament will be as follows:—Two 8-in., four 7-in., six 12-lb., and six 1½-lb. quick-firing guns, with two 18-in. torpedo tubes. She has an armour belt varying from 7 in. to 4 in. in thickness, and a conning tower with a 6-in. armour belt. There was a large company present, including many Consular and other foreign representatives, as well as Captain Stang, Norwegian Artillery; Captain Morch, who has superintended the building of the vessel, and Colonel Swan, representing Sir W. G. Armstrong & Co. The christening ceremony was performed by Mme. Stang, who was stated to be a descendant of Harald Haarfagre, the first King of Norway. During the speaking which followed it was pointed out that this was the first important armour-clad built for the Norwegian Navy, and that the *Harald Haarfagre* marked a great advance in the naval history of Norway.

Afghanistan.—On Monday, January 4th, Messrs. William Gray & Co., Limited, launched the fine steel screw steamer *Afghanistan*, which they have built for Messrs. Frank C. Strick & Co., Limited, of Swansea and London. Her principal dimensions are:—Length, over all, 316 ft.; breadth, extreme, 43 ft.; and depth, moulded, 20 ft. 10 in.; and her class will be the highest at Lloyd's. The type is that of partial awning-deck, with raised quarter-deck and poop, and the rig fore-and-aft schooner, with telescoping topmasts. Very tasteful cabin accommodation will be provided under the poop, consisting of saloon, state-rooms, captain's and officers' rooms. The engineers' quarters are amidships, and the crew's berths forward. The sides of the vessel are supported by strong web-frames, taking the place of hold beams as far as possible, and leaving a clear hold for stowing bulky goods. A cellular double-bottom is fitted and also an after-peak tank for water ballast, and iron grain divisions, while the steam windlass, steam steering gear amidships, hand screw gear aft, steam winches, patent donkey boiler, and the whole of the outfit are of the most approved description. The machinery for the *Afghanistan* will be supplied by the Central Marine Engine Works of Messrs. William Gray & Co., Limited, the engines being of the triple-expansion type with cylinders 23 in., 36½ in., and 62 in. diameter and a piston stroke of 39 in., to receive steam from a large steel multitubular boiler, working by forced draught at a pressure of 160 lbs. per square inch. The vessel and machinery have been constructed under the superintendence of Mr. Archibald Walker and Captain Rosser on behalf of the owners, and the ceremony of naming her *Afghanistan* was gracefully performed by Mrs. W. C. Gray, of Staincliffe, Seaton Carew.

Fitzclarence.—On Monday, January 4th, there was launched from the yard of the Tyne Iron Shipbuilding Co., Limited, of Willington Quay-on-Tyne, a steel screw steamer of the following dimensions, viz.:—Length, 365 ft.; breadth, 47 ft.; depth, 29 ft. 9 in., and class 100 A1 at Lloyd's on the three-deck rule. This vessel has water ballast fitted right fore-and-aft on the cellular system, and is also fitted with all modern improvements for the rapid loading and discharging of cargo, including seven double cylindered steam winches, direct-acting steam windlass, large donkey boiler, steam steering gear by Messrs. Caldwell & Co., Limited, and Hastie's screw gear aft. The engines, which are to be supplied by Messrs. The North Eastern Marine Engineering Co., Limited, are of the triple-expansion type, having cylinders 27 in., 43 in., and 72 in., by 45 in. stroke, and working at a pressure of 170 lbs. On leaving the ways the vessel was named the *Fitzclarence* by Mrs. Bone, of North Shields.

St. Hilda.—On January 4th Messrs. Wood, Skinner & Co., of Bill Quay, Newcastle, launched for the St. Hilda Steam Fishing Co., Limited, of Hartlepool, a finely-modelled steel and iron screw trawler, the principal dimensions of the vessel being as follows, viz.:—Length, 100 ft.; breadth, moulded, 19 ft.; depth, moulded, 10 ft. She is fitted with all recent improvements, including a powerful steam trawl winch, substantial trawl gear, &c. The vessel will be fitted with a set of compound surface-condensing engines, constructed by the North-Eastern Marine Engineering Co., Limited, at their Wallsend Works, having cylinders 15 in. and 28 in. diameter respectively, by 20 in. stroke, steam being supplied from a steel multitubular boiler 10 ft. diameter by 9 ft. long, working at 100 lbs. pressure. Both the ship and engines have been built under Lloyd's special survey to attain the highest class—100 A1, trawlers. As the vessel left the ways she was named *St. Hilda* by Miss Glass, of Wingate.

Sairina.—On January 4th an iron steam ketch of about 150 tons gross, named the *Sairina*, was launched at Hull for Messrs. C. Hellyer & Co., Limited, Hartlepool.

Elsie.—On January 5th there was launched by Mr. Richard Dunston, at Thorne, an English oak-built keel, to the order of Messrs. Tate & Hinchliffe, of Hull, of the following dimensions, viz.:—61 ft. long, 15 ft. 6 in. beam, and 6 ft. 6 in. high. This vessel has been specially constructed for the Hull and Sheffield trade, and is intended to carry 100 tons deadweight. She was christened the *Elsie*.

Victorian Era.—On January 16th Messrs. W. Dobson & Co. launched at Low Walker-on-Tyne the steel screw steamer *Victorian Era*, of the following dimensions:—Length, 336 ft.; breadth, 45 ft.; depth, 22 ft. 2¼ in. To carry 4,600 tons deadweight on a light draught. The machinery by the Wallsend Slipway and Engineering Co., Limited, consists of a set of triple-expansion engines, having cylinders 23 in., 38 in. and 61 in. diameter by 42 in. stroke, with two large steel boilers.

Kirriemoor.—On January 18th there was launched from the yard of Messrs. Readhead & Co., South Shields, a large screw steamer, built to the order of Messrs. Walter Runciman & Co., Newcastle. The vessel is 326 ft. long, 47 ft. broad, and has a depth moulded of 26 ft. 4½ in. She is built on the improved single-deck principle, and has a deadweight carrying capacity of about 5,500 tons on a light draught. She is classed 100 A1 at Lloyd's. Her engines are of the triple-expansion type, with cylinders 24 in., 40 in. and 64 in. in diameter, by 42 in. stroke. Steam will be supplied by two large steel boilers working at a pressure of 160 lbs. to the square inch. The vessel was named the *Kirriemoor*.

Takao.—On Monday, January 18th, Messrs. Wigham Richardson & Co. launched the second of two sister vessels which they have been building to the order of the Osaka Shosen Kabushiki Kaisha, of Osaka, Japan. The vessel is 261 ft. in length, 35 ft. beam, and 23 ft. deep; she will be rigged as a two-masted fore-and-aft schooner, and will have accommodation for first and second class passengers in a bridge amidships, and in a poop, and there are also fittings for a large number of steerage passengers. The steamer will be propelled by triple-expansion engines, which, with their boilers are being constructed by Messrs. Wigham Richardson & Co. The vessel will be lighted throughout by the electric light, and the appliances for working the ship and for loading and discharging the cargo are of the most modern and improved kind, and include steam windlass, four steam winches, steam steering gear, &c. Amongst those present at the launch were Mr. S. Konishi, superintendent engineer of the Osaka Shosen Kabushiki Kaisha, under whose superintendence the steamer has been constructed. As the vessel left the ways she was named the *Takao*, the ceremony being gracefully performed by Miss Dora Richardson, younger daughter of Mr. Wigham Richardson, of the builders' firm.

Arranmoor.—On January 19th there was launched from the yard of Messrs. John Blumer & Co., Sunderland, to the order of the South Shields Steam Shipping Co., Limited, the steamship *Arranmoor*. Her dimensions are:—Length over all, 300 ft.; breadth, 43 ft.; depth, 19 ft. 9 in. She is built to Lloyd's highest class, and specially designed to carry a deadweight cargo on a light draught. The engines will be supplied by Messrs. John Dickinson & Sons, Limited, Sunderland, and are of the triple-expansion type. The vessel is fitted with the most modern appliances for loading and discharging cargo. The christening ceremony was gracefully performed by Miss Robinson, of South Shields, who named her the *Arranmoor*.

Vlug.—On Wednesday, January 20th, Messrs. Wm. Gray & Co., Limited, launched the fine steel screw steamer *Vlug*. She is of the following dimensions, viz.:—Length over all, 243 ft.; breadth, 34 ft. 6 in.; depth, 17 ft. 3 in., and has been built to the order of Messrs. Nielsen, Van Holk & Co., of Amsterdam. She will take Lloyd's highest class, and her deck erections consist of a raised quarter-deck, bridge-deck, and topgallant forecastle. The saloon and accommodation for captain and officers will be fitted in a deck-house amidships, and the engineers' berths in a house on deck also, and the crew's quarters in the forecastle. The vessel is built on the deep-frame system, with cellular double bottom for water-ballast, and after-peak ballast tanks, steam winches, donkey boiler, steam steering gear amidships, screw gear aft, steam windlass, schooner rig, boats on beams overhead, and all modern appliances will be fitted. The engines are of the triple-expansion type, working on three cranks. They are supplied by the Central Marine Engine Works of William Gray & Co., Limited. The cylinders are 18 in., 28½ in., and 47½ in. diameter, and the piston-stroke 33 in. The boiler, built of steel, of large size will give an ample supply of steam at a working pressure of 160 lbs. per square inch. The vessel has been built under the superintendence of Captain B. Eliasen and Mr. Tideman on behalf of the owners, and the ceremony of naming her *Vlug* was gracefully performed by Miss C. Baines, of West Hartlepool.

Thornhill.—On January 21st Messrs. Short Brothers launched from their shipbuilding yard at Pallion a handsomely-modelled steel screw steamer, built to the order of Messrs. Taylor & Sanderson, Sunderland, of the following dimensions, viz.:—Length, 350 ft.; breadth, 45 ft.; and depth, moulded, 26 ft. 9 in.; and is a fine type of naval architecture. She has been constructed of Siemens-Martin steel to the highest class in Lloyd's Registry, and has an open poop and long bridge amidships. The double bottom fore and aft, which provides ample water ballast, is divided for trimming purposes; there are six steel bulkheads with four cargo holds, having in all six powerful steam winches for the rapid loading and discharging of cargoes, steam being supplied for driving the winches by a large multitubular donkey boiler placed in the stokehold. The steeri engine is placed in the engine-room with controlling rods to wheel-house on flying bridge. The vessel is to be fitted with triple-expansion engines by Messrs. William Allan and Co., Limited, Sunderland, having cylinders 25 in., 40 in. and 67 in. respectively, with a stroke of 45 in., steam being supplied at 160 lbs. working pressure by two large steel boilers with all the latest appliances in marine engineering. On leaving the ways the vessel was named *Thornhill* by Miss Winifred Taylor, of Thornhill Tower.

Steel Barge.—On January 23rd Mr. Joseph Scarr, of Beverley, launched a steel barge of the following dimensions, viz.:—Length, 70 ft.; beam, moulded, 20 ft. 6 in.; depth, moulded, 9 ft. 6 in., with a total carrying capacity of 1,050 quarters of grain, for which trade it is intended. This is the third built of four barges ordered by Mr. Rank, corn miller, Hull.

LAUNCHES—Scotch.

Allinga.—On December 21st Messrs. Scott & Co. launched at Greenock the steel twin-screw steamer *Allinga*, built for the Australian coasting trade, of 2,250 tons gross, and of the following dimensions:—Length, 280 ft.; breadth, 42 ft.; depth, 23 ft. She will be supplied by the builders with engines of 1,700 I.H.P.

Lady Roberts.—On December 22nd the Ailsa Shipbuilding Co., Troon, launched to the order of the British and Irish Steam Packet Co., Limited, Dublin, for their Channel passenger and cargo trades, a steel screw steamer, 275 ft. by 36 ft. by 17 ft. 6 in. moulded. She is built to the highest class at Lloyd's, and will be fitted by Messrs. Dunsmuir & Jackson, Govan, with triple-expansion engines, having cylinders 25 in., 40 in., and 65 in. by 42 in. stroke. She was named the *Lady Roberts* by Mrs. M'Credie, of Troon.

Sybarite.—On December 22nd Messrs. Chambers Brothers, Greenock, launched a steam yacht, 70 ft. in length, for Major Turner. She was named the *Sybarite*, and is intended for pleasure cruising in the Mediterranean.

Nyanza.—On December 24th Messrs. Alex. Stephen & Sons launched for Messrs. Naclay & McIntyre, Glasgow, a steel screw steamer, which was gracefully named *Nyanza* by Mrs. Mackinlay, Kelvinside. The *Nyanza* is the fourteenth steamer built at Linthouse for the same owners. Her dimensions are 370 ft. by 48 ft. by 27½ ft., with short full poop, bridge-house and topgallant forecastle. Accommodation for captain and officers, etc., is all on the bridge deck, while the crew are as usual, berthed in the forecastle. The appliances for navigating and for work in harbour are complete, and of the very best type. The engines (also built by Messrs. Stephen) have cylinders 25 in., 41 in. and 67 in. diameter by 45 in. stroke, supplied with steam from two boilers, working at 175 lbs. pressure and fitted with Howden's forced draught.

Moana.—On December 24th a steel steamer of about 3,870 tons gross, named the *Moana*, was launched at Dumbarton for the Union Steamship Co. of New Zealand

Australia.—On December 25th Messrs. Russell & Co. launched at Port-Glasgow, to the order of the Australia Ship Co., Limited, Greenock, the three-masted full-rigged sailing ship *Australia*. The dimensions are:—Length, 270 ft.; breadth, 40 ft. 6 in.; depth, 23 ft. 7 in. The vessel registers about 2,000 tons, and is built to Lloyd's highest class.

Fujisan Maru.—On December 25th there was launched from the shipbuilding yard of Messrs. Archibald M'Millan & Son, Limited, Dumbarton, a finely-modelled steel screw steamer, the first of two similar vessels being built to the order of Messrs. Mitsui & Co., of Nagasaki and London. The principal dimensions are:—Length, 290 ft.; breadth, 38 ft.; depth, 22 ft.; 1,900 tons gross register. The vessel is being built under special survey of Lloyd's, and under the instructions of Mr. A. R. Brown, the Japanese Consul at Glasgow. She has a large bridge, topgallant forecastle and hood aft, two complete decks of steel—the upper as also the bridge and forecastle decks being sheathed with teak. Water ballast is provided for in cellular double-bottom fore and aft (sub-divided into six compartments), in deep tanks amidships (which can also be used for cargo), and in aft. peak. The accommodation for officers, engineers, and a few passengers is arranged in large airy rooms under bridge deck, while the crew and petty officers are located in the topgallant forecastle. The captain's room and chart-room are situated in a large teak deckhouse on bridge deck. Complete arrangements are made on deck for navigating the vessel and the rapid and efficient working of cargo. A number of cargo and coaling ports are provided in ship's sides, and gangways fitted in bulwarks abreast of hatchways. The machinery, which is being supplied by Messrs. David Rowan & Son, Glasgow, has cylinders 23 in., 38 in., and 62 in. diameter, with a stroke of 42 in., and the steam pressure is 175 lbs. The ceremony of naming the vessel *Fujisan Maru* was performed by Miss Alpine, The Manse, Dumbarton, who, in accordance with the Japanese custom, liberated a flock of pigeons on the floating of the vessel.

Kingston.—On December 30th a steel steam yawl of about 162 tons gross, named the *Kingston*, was launched at Glasgow for Messrs. Hagerup, Doughty & Co., of Grimsby.

Leeds.—On December 30th a steel steam yawl of about 162 tons gross, named the *Leeds*, was launched at Glasgow for Messrs. Hagerup, Doughty & Co., of Grimsby.

Margate.—On December 30th a steel steam yawl of about 162 tons gross, named the *Margate*, was launched at Glasgow for Messrs. Hagerup, Doughty & Co., of Grimsby.

Indra.—On December 30th Messrs. Charles Connell & Co. launched at Whiteinch, on the Clyde, a steel screw steamer for Mr. T. B. Royden, of Liverpool. The dimensions are:—Length, between perpendiculars, 430 ft.; breadth moulded, 51 ft.; depth moulded, 34 ft.; carrying about 9,000 tons. The engines are being constructed by Messrs. David Rowan & Son, Glasgow, and are of the triple-expansion type, with single-ended boilers fitted with Howden's system of forced draught. As the vessel left the ways she was named *Indra* by Miss Royden.

Christine.—On December 30th Messrs. David J. Dunlop & Co., Port-Glasgow, launched a steel screw steam yacht for Sir William Scott, Bart., of Ancrum House, Roxburghshire. The new vessel is 130 ft. long, 20 ft. beam, and 12½ ft. deep, and of 240 tons Thames measurement. The engines are of the triple-expansion type, with ample boiler power for a pressure of 160 lbs., and a high rate of speed is expected. The new yacht was named *Christine*.

Marguerite Depeaux.—On January 7th there was launched from the shipyard of Messrs. Cumming & Ellis, at Inverkeithing, a handsomely-modelled steel screw steamer to the order of M. Depeaux, Rouen, of the following dimensions:—Length, 165 ft.; breadth, 25 ft.; depth, 12 ft. 6 in., into which will be fitted powerful engines by Messrs. John Cran & Co., of Leith, and from which a loaded speed of 10 knots is expected. The vessel has been built under the special survey of Lloyd's surveyor, and to class 100 A1 at Lloyd's, and is fitted with water ballast in cellular double-bottom, as well as all the latest improvements for rapid loading and discharging of cargo. As the vessel left the ways she was christened the *Marguerite Depeaux* by Miss Eva Ellis, Inverkeithing. The vessel has been under the superintendence of Captain Carpenter.

Owenacurra.—On January 7th Messrs. Fleming & Ferguson, Limited, engineers and shipbuilders, Paisley, launched the twin-screw hopper steamer *Owenacurra* for Waterford Harbour. The vessel will be capable of carrying 1,250 tons, and have two sets of triple-expansion engines indicating 900 H.P.

Vestra.—On January 18th there was launched from the yard of Messrs. Ramage & Ferguson, Limited, a screw steamer of about 1,000 tons, built to the order of Messrs. J. T. Salvesen & Co., Grangemouth. The dimensions are:—216 ft. by 32 ft. by 16 ft. 3 in. moulded, with triple-expansion engines, having cylinders 15 in., 24 in., 39 in. by 30 in. stroke, and one large boiler working at 160 lbs. pressure. This vessel, which will carry 1,300 tons deadweight, and is expected to steam 10 knots, is a sister ship to the steamers *Vala* and *Vina*, built by Messrs. Ramage & Ferguson, Limited, for the same owners in the beginning of 1894. On leaving the ways the vessel was named *Vestra* by Miss Salvesen, Mayfield House, Trinity.

Kawachi Maru.—On January 20th a further addition to the fleet of merchant steamers being built for the Nippon Yusen Kaisha, of Tokio, Japan, was launched from the yard of Messrs. Napier, Shanks & Bell, at Yoker. This vessel, which is named the *Kawachi Maru*, is similar to others which have been recently launched on the Clyde and at Belfast, being 445 ft. keel and forerake, and 49 ft. beam, with a gross tonnage of about 6,000 tons. She is classed 100 A1 at Lloyd's, and will carry a large deadweight of cargo, having at the same time accommodation of a superior description for a large number of first-class and steerage passengers. The most approved appliances are provided to secure safety, economical working, and prompt handling of cargo, and the vessel will have a complete installation of electric light, including signal and Suez Canal lights, fitted by Messrs. W. C. Martin & Co., of Glasgow; efficient ventilation will be secured by the use of the "Grahtryx" Ventilating Co.'s special machinery and ventilators. The engines, twin screw and boilers of 200 lbs. pressure, supplied by Messrs. Dunsmuir & Jackson, of Govan, are expected to develop a high power, and are constructed and furnished in the best style. The vessel has been built under the supervision of Captain Periam and Mr. George McFarlane.

Dredger.—On January 20th Messrs. Fleming & Ferguson, Limited, shipbuilders and engineers, Paisley, launched from their yard a powerful bucket-ladder dredger, built to the order of the Ipswich Dock Commissioners. The dimensions of the vessel are 116 ft. by 25 ft. by 9 ft., and she will be capable of raising 350 tons of material per hour from a depth of 30 ft. She has been designed to cut in front, which enables it to cut its own flotation through banks and shoals and work close up to quay walls, &c. The vessel is constructed of Siemens-Martin steel, with cast steel gearing.

Raglan Castle.—On January 20th Messrs. Barclay, Curle & Co., Limited, launched from their shipbuilding yard at Whiteinch, the *Raglan Castle*, a screw steamer of 4,320 tons gross, built to the order of the Castle Mail Packets. In design she is practically a duplicate of the *Dunolly Castle*, but she is 15 ft. longer. Her dimensions are:—Length, 397 ft.; breadth, 46 ft. 3 in.; depth, 30 ft. She is classed 100 A1 at Lloyd's, and is built of steel, with a double bottom, three decks, a full poop, a long bridge, and a topgallant forecastle. Her model is specially adapted for carrying a large cargo at a moderate draught, and is suitable in all respects for entering the harbours of South Africa. Every consideration has been given to the deck-gear for the rapid loading and discharging of cargoes of every description. The vessel will be schooner-rigged, with two masts, the foremost carrying square sails. Awnings will be fitted fore and aft. Accommodation, consisting of a dining-saloon panelled in oak, a drawing-room, and a smoking-room, will be provided for cabin passengers on the bridge-deck. The poop and the after-part of the vessel are specially adapted to accommodate a large number of third-class passengers. The ship will be amply lighted, her ventilation has been carefully attended to, and a continuous water service will be supplied. The recommendations of the emigration authorities with regard both to sanitary and life-saving appliances have been attended to in every detail. The lifeboats will be carried on the rail, so that they can be put overboard instantaneously. The steam-steering engine will be placed on the rudder-head, and controlled from the navigating bridge; the captain and principal officers will be berthed close to the bridge, while the engineers will be accommodated near their work. There will be ample space for promenade and sports on deck. The ship will, in fact, be replete with all the conveniences and comforts of a first-class passenger steamer. She will be fitted by the builders with machinery of about 2,200 H.P. of the latest improved type, on the triple-expansion principle. She will have three boilers of large dimensions. Miss Currie, a niece of Sir Donald Currie, of Leith, performed the naming ceremony. Afterwards the builders entertained the launch party at luncheon in the drawing office. Sir Andrew Maclean presided.

LAUNCHES—Irish.

Belvidere.—On December 12th a steel steamer of about 1,450 tons register, named the *Belvidere*, was launched at Belfast for Messrs. R. and C. Allan, Glasgow.

Delphic.—On January 5th Messrs. Harland & Wolff launched at Belfast a large twin-screw steamer named the *Delphic*, the latest addition to the fleet of White Star steamers. The dimensions of the vessel are:—475 ft. long by 55 ft. beam, the gross tonnage being about 9,000, and she will be employed in the New Zealand trade, with other vessels of the White Star and the Shaw, Savill and Albion line. The distance traversed on each voyage exceeds 26,000 miles. The new vessel, like the *Gothic*, will be fitted with two sets of triple-expansion engines and twin screws, thus affording an additional element of safety. The *Delphic* will, in addition to ordinary coal and cargo space, be fitted with two large refrigerating machines on the dry-air system, and there will be a total refrigerated space in three holds of about 285,000 cubic feet, or equal to about 100,000 carcases of sheep.

Goorkha.—On January 23rd Messrs. Harland & Wolff, Limited, launched from their yard at Belfast the *Goorkha*, a large twin-screw steamer, built to the order of the Union Steamship Co. It is the last of an order for three intermediate steamers which was placed some time ago with the Queen's Island firm, and she is the eighth vessel constructed for the owners by Messrs. Harland & Wolff during the last few years. Like her sister ships the *Gascon* and the *Gaika*, which were completed recently, the *Goorkha* is an intermediate steamer, and will be employed in the passenger and cargo service to and from South Africa. She has been constructed on the lines of the "G" class—the *Goth*, the *Greek*, the *Guelph*, and the *Gaul*. These four vessels have earned from a section of the South African travelling public the pseudonym of the "Four G's," and they have as their characteristics ample carrying capacity, fair speed, with a small coal consumption, and comfort and cleanliness for passengers. The *Goorkha* is 6,200 tons gross, and the dimensions are:—Length, 430 ft.; breadth, 52 ft.; and depth, 33 ft. She has two sets of triple-expansion engines, and the provision of twin screws gives greater safety in case of a breakdown. While the new vessel has a large carrying capacity on a light draught of water, unusually complete accommodation is provided for first, second, and third-class passengers; and she will be specially fitted with every convenience, including an electric light installation, refrigerator, and cold chambers for the conveyance of fruit. With her light draught she will be able, if necessary, to cross the bar either at East London or Natal. The *Gascon* is intended to sail on her maiden voyage to the Cape on the 20th March, followed by the *Gaika* early in May. As the vessel left the ways Lady Cadogan gracefully named her the *Goorkha* amid the loud cheers of the spectators.

TRIAL TRIPS.

Cluden.—On December 17th the new steel screw steamer *Cluden*, built and engined by Messrs. John Readhead & Sons, West Dock, South Shields, to the order of Messrs. Steel, Young & Co., London, was taken to sea on her official trial trip. The vessel, which is 327 ft. over all, 43 ft. broad, and 24 ft. 4½ in. deep, has a carrying capacity of about 5,000 tons. She is fitted with tri-compound engines, having cylinders 24 in., 40 in. and 64 in., by 42 in. stroke, steam being supplied from two large steel boilers, working at a pressure of 160 lbs. per square inch. The trial was in every respect satisfactory, a mean speed of 11½ knots being attained. She has been built under special survey, and is classed 100 A1 at Lloyd's.

Lily.—On December 22nd the new steamer *Lily*, built by Messrs. Blackwood & Gordon, Port-Glasgow, for the Glasgow, Dublin and Londonderry Steam Packet Co. Limited (Messrs. Alexander A. Laird & Co.), Glasgow, ran her trial trip on the Firth of Clyde. The vessel left Gourock at 10 o'clock, and, after running several times over the measured mile at Skelmorlie, steamed up Loch Long to Loch Goil and back to Gourock. On the mile an average speed of slightly over 12 knots was attained. This the builders, and also the representatives of the owners who were on board, considered highly satisfactory. Throughout the trials the machinery worked well. The *Lily* is a steamer of about 665 tons gross, built to Lloyd's highest class, and is 190 ft. long, 29 ft. 3 in. broad, and 14 ft. deep, moulded. She has accommodation for 40 saloon passengers and for a number of steerage and deck passengers, and is arranged for the carriage of cattle and cargo between this country and the various Irish ports. The engines, also by Messrs. Blackwood & Gordon, are triple-expansion, and have cylinders 15 in., 24½ in., and 40 in. diameter respectively, with a stroke of 30 in. The steamer is fitted with all modern appliances, including a complete installation of electric light.

St. Mary.—On December 23rd the new steel screw steamer *St. Mary*, built by Messrs. C. S. Swan & Hunter, Limited, of Wallsend-on-Tyne, to the order of a Liverpool firm, left the Tyne for the official trial of her machinery. The vessel is of the following dimensions:—Length, 312 ft.; breadth, 42

6 in.; and depth, 22 ft. The machinery, which has been built by the North-Eastern Marine Engineering Co., Limited, Wallsend, consists of a set of triple-expansion engines, having cylinders 23 in., 38 in., and 61 in. in diameter, by 42 in. stroke, and two boilers, working at a pressure of 160 lbs. per square inch. Throughout the trial the machinery worked with smoothness, and gave every satisfaction.

Cambrian.—On December 23rd the s.s. *Cambrian*, the largest and finest steamer yet built in the Hartlepools, left the Tyne where she had been dry-docking, and taking in cargo and bunkers, on her first voyage to New York. The vessel has been built to the order of Sir Christopher Furness, for the Wilsons-Furness line of steamers, to trade between London and New York. Her length over all is 464 ft., breadth 49 ft., depth 34 ft., and measurement capacity 10,000 tons. A shelter deck is carried over the whole vessel, and above that a long bridge deck. Stalls are fitted under these decks to accommodate over 700 head of cattle. The bridge deck is also available for carrying horses. A large number of wide vents with revolving cowls have been fitted to supply fresh air to the cattle. In order that cargo may be expeditiously dealt with seven hatchways are fitted, and nine powerful steam winches with extra whipping drums to work from a large number of derricks. The engines are of the triple-expansion type, and have been provided by the Central Marine Engine Works of the builders. They are the largest set of engines hitherto built in the Hartlepools, the cylinders being 32 in., 54 in., and 86 in. in diameter, by 54 in. stroke. They are supplied with steam at 185 lbs. pressure by three very large boilers, worked on Howden's forced-draught system. The engines have been specially designed for the vessel in view of the fact that she will be continuously engaged in North Atlantic work, all the parts being made exceptionally heavy. The engines and boilers are capable of producing about 4,000 I.H.P., which will give the ship a speed of about 14 knots. The building of the engines and boilers and all accessory machinery has been personally superintended throughout by Mr. J. F. Kitching, the superintendent engineer for Sir Christopher Furness. Captain Manley supervised the construction of the ship. After the usual adjustment of compasses by Mr. Baird, on behalf of the manufacturers, Messrs. Sir William Thomson & Sons, Glasgow, and Mr. Berry, the local compass adjuster, the vessel had a trial previous to her proceeding on her first voyage to New York. There were present Captain Bristow, representing the owners; Mr. John Spear, the superintendent engineer for Messrs. Thomas Wilson, Sons & Co., of Hull; Mr. Birrell, on behalf of Messrs. James Howden & Co., Glasgow; Mr. Kikkert, Dutch naval engineer; Mr. Purvis, representing the builders of the ship; and Mr. T. Mudd those of the engines. The engines ran in a perfectly satisfactory manner, all the working parts remaining quite cool and giving no trouble whatever. After discharging her visitors the vessel proceeded on her voyage.

Leonidas.—On December 24th the s.s. *Leonidas*, built by Messrs. Short Brothers, Sunderland, for Mr. A. Embiricos, of Braila, went on her official trial trip. The vessel is built to Lloyd's highest class, and is of the following dimensions:—Length, 320 ft.; breadth, 43 ft.; depth, moulded, 24 ft. She carries about 4,400 tons on Lloyd's summer freeboard, and is rigged as a two-masted schooner, with steel telescopic topmasts. The machinery, by Messrs. J. Dickinson & Sons, Limited, of Sunderland, is of the triple-expansion type, with cylinders 22 in., 36½ in. and 62 in. diameter by 42 in. stroke. There is one boiler with three Morison's furnaces, fitted with forced draught. The trial gave complete satisfaction, the speed attained being quite up to the requirements. The whole of both ship and engine work has been constructed under the supervision of Messrs. William Esplen & Son, of Liverpool and London.

Gerd.—On December 25th the new steel screw steamer *Gerd*, built by Messrs. R. Craggs & Sons, of Middlesbrough, for Messrs. Bachke & Co., Trondhjem, ran her trial trip. A speed of 9 knots was maintained on fully-laden trim, which was considered highly satisfactory. The engines, by Messrs. Sir Chris. Furness, Westgarth & Co., Limited, worked at 84 revolutions with perfect smoothness.

Affonso d'Albuquerque.—On January 1st the steam trials of the Royal Portuguese corvette *Affonso d'Albuquerque* took place in the Sea Reach and proved entirely satisfactory. This vessel has had new boilers, and undergone a complete machinery overhaul and refit at the hands of the Thames Ironworks. She was towed over from Lisbon in August last in a disabled and badly-damaged condition, and at once dry-docked at the company's yard, whence she has only just emerged. To all appearance she looks a new vessel, and a particularly smart one too. The Portuguese Government were represented on the trial trip by Captain Coutinho, and the Thames Ironworks Co. by Mr. Austin Doe. At the conclusion of the trials the *Affonso d'Albuquerque* proceeded to take in her explosives and then steamed right away for Lisbon.

Eugenia.—On January 6th this fine vessel, which was recently constructed by Messrs. Hawthorns & Co., Limited, to the order of J. Gardner Cassatt, Esq., of Philadelphia, underwent her official trial in the Firth of Forth. She has been constructed under the superintendence of Mr. A. H. Brown, 10, Pall Mall, London, and on her trial proved herself to be not only a fine vessel, but also an excellent sea ship. She is luxuriously fitted up, and is provided with all the latest appliances for a vessel of her description. She left on January 20th for a cruise in the Mediterranean, afterwards proceeding to New York.

Garmoyle.—On January 8th the new screw steamer *Garmoyle*, which has been built by the Caledon Shipbuilding & Engineering Co., Limited, Dundee, to the order of the Clyde Shipping Co., Limited, Glasgow, performed her official trial trip. The weather was extremely boisterous, but in spite of the unfavourable circumstances a most satisfactory run was made, a speed of 15 knots having been attained by the new steamer. The *Garmoyle* has been constructed for the Clyde Shipping Co.'s cargo and passenger trade between Glasgow, Ireland, and London, and everything has been done in the fitting up of the vessel to minister to the comfort of passengers. Her principal dimensions are:—Length, 260 ft.; breadth, 33 ft. 6 in.; depth, 16 ft. 4 in.; and gross tonnage, 1,250. It may be mentioned that the *Garmoyle* is the fourteenth vessel built by the Caledon Shipbuilding Co. for the Clyde Shipping Co., and has been constructed in excess of the highest class of the British Corporation register.

Thrasher.—On January 13th Messrs. Laird Bros., of Birkenhead, took out H.M.S. *Thrasher* and completed a very satisfactory official full-speed trial in presence of the Admiralty representatives. The speeds obtained on six runs on the measured mile at Skelmorlie were as follows:—

Miles.	Steam.	Time.		Speed.
		M.	S.	
1	207	1	58	30·51
2	208	2	1½	29·64
3	210	1	55½	31·16
4	208	2	0	30·00
5	205	1	58	30·51
6	207	2	1	29·75

The mean speed worked out at 30·34 knots. The trial was continued for the usual three hours, the vessel being taken as far down as Pladda, and the average speed for the continual steaming was 30·04 knots. The Admiralty was represented by Messrs. Welch and Emdin, of the Construction and Engineering Branches respectively; Devonport Dockyard and Reserve by Messrs. Gregory and Deacon; and the contractors by Mr. William Laird, of Birkenhead, Mr. R. Ratsey Bevis conducting the trial on their behalf. This concludes the exhaustive series of trials set the first four of the 30-knot destroyers constructed by Messrs. Laird for the Admiralty.

Avondale Castle.—On January 13th the screw steamer *Avondale Castle*, built by the Fairfield Shipbuilding and Engineering Co., Limited, for the Castle Mail Packets Co., Limited, was put through her official trials in the firth. The *Avondale Castle* is an intermediate steamer for the Cape Service, and is a single-screw steamer classed 100 A1 at Lloyd's, 440 ft. in length, 50 ft. in breadth, and 33 ft. in depth, with a gross tonnage of about 5,600. She has a straight stem, an elliptical stern, a capacious poop, a very long bridge, and a topgallant forecastle, and is rigged as a four-masted schooner, with yards on the foremast. The rake and spacing of the masts, in conjunction with an imposing funnel, present a particularly pleasing effect. Internally the vessel is divided into numerous watertight compartments, and there is a double bottom running the whole length, which again is subdivided into various compartments for carrying water ballast. The cargo holds are five in number, and have capacity for about 6,000 tons of cargo, and each hold has a separate hatch and double steam winches for quick despatch in loading and discharging. The main hatch is specially constructed to take in boilers and mining machinery of the largest dimensions, for lifting which a steel spar is provided, along with adequate gins and steel wire gear. The passenger accommodation is commodious and extremely comfortable. There are about 170 first and second class berths placed amidships, with dining saloons and drawing and smoking-rooms for each class. All these are in polished hardwood, artistically designed and handsomely upholstered. Libraries and musical instruments have also been provided. A very large proportion of the sleeping-rooms are fitted for two persons only, subdivision and privacy being specially aimed at. A few family cabins for four are also provided. The third-class passengers have the poop and after 'tween decks entirely to themselves. The dining-rooms are spacious, and are upholstered throughout, and the sanitary quarters are liberally supplied with baths. The decks are very spacious, and there is ample room for recreation. The equipment of boats, &c., is of the highest class for a first-class passenger steamer. The engines are of the triple-expansion type, with three cylinders and three cranks, working at a high pressure, steam being supplied by four tubular steam boilers. The shafting is of forged ingot steel and the propeller of bronze, the whole designed on the most modern principles to obtain efficiency and work economically. On the trial, the vessel being in a light condition, a speed of about 15 knots was easily maintained, the machinery working with complete smoothness and the boilers providing abundance of steam. Immediately after the trial the steamer left the Tail of the Bank for London, and will at once be put into the service of the line.

Christine.—On January 13th the new steam yacht *Christine*, of 245 tons Thames measurement, built and engined by Messrs. David J. Dunlop & Co., Port-Glasgow, to the order of Sir William Scott, Bart., of Ancrum Castle, Roxburghshire, ran her official trial on the Firth of Clyde, when the weather conditions were most favourable. The vessel, which was designed by the builders, was built of steel to 100 A1 class at Lloyd's, and is divided into several watertight compartments by bulkheads. Her dimensions are as follows:—Length between perpendiculars, 130 ft., and from taffrail to billethead, 152 ft. 6 in.; breadth, 20 ft.; depth, moulded, 12 ft. 6 in.; net tonnage, 107·44, and gross tons, 195·59. The arrangement of the various apartments is excellent, the crew being berthed forward, and immediately abaft is the mess-room, with the captain's and engineers' rooms adjoining it. Forward of the engines and boilers is the owner's own room, on the starboard side, with Miss Scott's private cabin on the port side. Aft of the engines is the main saloon, which extends the full breadth of the vessel. This apartment, like Sir William's and Miss Scott's, is done up in a good, substantial style, the walls of them being of oak and the ceilings painted white, relieved by gold. There are several bedrooms, all of which are tastefully furnished. Forward of the boiler-casing there is a deck-house, in which there is a staircase leading down to the forward cabins. A goodly-sized dining saloon and pantry and galley are also contained in this erection, on the top of which the navigating of the vessel is conducted. The machinery consists of a set of triple-expansion engines, with cylinders, 11 in., 18 in. and 28 in. in diameter respectively, with a piston stroke of 24 in. Steam is supplied at a working pressure of 160 lbs. by a single-ended multitubular boiler. The *Christine* has a splendidly modelled hull, with a clipper stem and plenty of freeboard, and is rigged with two masts. The trial throughout was most satisfactory, the engines working without a hitch. A speed of 11·4 knots was obtained, being the mean of two runs on the mile at Skelmorlie. Throughout the construction of the vessel she has been inspected by Captain Donald Cameron, who takes command.

Milwaukee.—On Saturday, January 16th, the splendid new steamer *Milwaukee*, just completed by C. S. Swan & Hunter, Limited, of Wallsend-on-Tyne for Messrs. Elder, Dempster & Co., of Liverpool, proceeded to sea for her trial trip. This vessel, which is the largest cargo steamer ever built in England, was launched from the builders' yard on the 11th November last, and has since been fitted with her machinery and completely equipped for her trade, which will be that of carrying general cargoes across the Atlantic, as well as live stock, such as cattle, sheep, &c., and for which purpose she is admirably adapted, having specially high 'tween decks, a complete system of ventilation and fresh-water service. The dimensions of the *Milwaukee* are 484 ft. length, and 56 ft. beam, with a moulded depth of 42 ft. 3 in., with highest classification at Lloyd's on the three-deck rule, with scantlings in excess of the rule requirements. She has a flush shade deck, on which are placed houses containing accommodation for the captain, officers, engineers, petty officers, &c., also a large steering house aft, in which is placed the hand and also the steam steering gear. The crew, including firemen, cattlemen, &c., are berthed forward under the topgallant forecastle. The *Milwaukee* will carry a measurement cargo of upwards of 18,000 tons in addition to about 700 tons of permanent bunker capacity, whilst her deadweight cargo is upwards of 11,600 tons. For rapidly handling the large cargoes which will be carried on board, an outfit of no less than 12 powerful steam winches is fitted, also derrick posts standing at the hatch sides, which posts are used also for ventilating the holds. A very powerful windlass by Clarke, Chapman & Co., Limited, with Abbots' stockless anchor is also fitted, with a steam steering gear by Messrs. Davis & Co. Electric light is fitted throughout by Messrs. W. H. Allan & Co. The propelling machinery has been constructed by the North Eastern Marine Engineering Co., Limited, and consists of a set of triple-expansion engines of the latest type, with cylinders 28 in., 46 in. and 75 in. diameter by 54 in. stroke, with three large steel boilers working at 180 lbs. pressure and fitted with Howden's system of forced draught. The propeller blades are of Parson's manganese bronze. See's ash ejector and other labour-saving appliances, also a complete system of fuel economisers, are introduced on board the vessel. The *Milwaukee* left her moorings at Wallsend on Saturday morning and proceeded to sea for the adjustment of her compasses, after which she was boarded by a large party, the builders of the steamer being represented by Messrs. G. B. Hunter, C. S. Swan, W. Denton, E. W. De Rusett and C. Stephenson. The engine builders were represented by Messrs. Roland Phillipson, Summers Hunter, and D. Myles. The owners were represented by Mr. H. Ward, Captain Evans, marine superintendent, and Mr. Lees, the superintending engineer; the vessel and machinery having been constructed under the superintendence of the latter two gentlemen. Messrs. Clarke, Chapman & Co. were also represented by Mr. H. Chapman. There was also on board Mr. Hay and Mr. Dudgeon, representing Messrs. Davis & Co.; Mr. J. Adam, and others. The *Milwaukee* at the time of her trial trip was in light trim, having on board about 1,800 tons of bunkers and 2,500 tons of water ballast, and during the speed trials developed about 3,500 I.H.P., and attained an average speed of 12 knots, and everything running in a perfectly satisfactory manner, the steamer on the conclusion of the speed runs started at once on her voyage to New Orleans in command of Captain Lugg.

Dunolly Castle.—On January 19th the *Dunolly Castle*, which has been built to the order of the Castle Mail Packets Co., went on her trial runs on the Clyde. The result was very satisfactory, a speed of 13½ knots being developed. The *Dunolly Castle* was launched from the yard of Messrs. Barclay, Curle & Co., Whiteinch, in the beginning of November. Her length is 382 ft.; breadth, 46 ft. 3 in.; depth, 30 ft., and her gross tonnage is 4,167. She has three single-ended boilers of large dimensions fitted for a working pressure of 180 lbs., and expected to develop 2,500 H.P. The engines have cylinders measuring 26½ in., 44 in. and 70 in. in diameter respectively, the stroke being 48 in. The steamer has been built as an extra boat for Messrs. Currie's South African service, being intended to carry goods not only to the Cape, but also to Madagascar and the Mauritius without transhipment. There is accommodation for 120 third-class passengers in state-rooms in the poop and after between decks, 30 first-class passengers in deck cabins amidships, and between 400 and 500 emigrants in open berths in the 'tween decks. The work of construction having been carried out in conformity with the transport regulations, special attention has been paid to ventilation, and there is a continuous water service in every section. The electric light is everywhere, and an ingenious method of bringing clusters of incandescent lamps to bear on any place where work is in progress has been adopted. The steering is done by means of Brown's steering gear, controlled from the bridge by telemeter. There are cold storage and refrigerating chambers for fruit carrying. The cargo hatches are of specially large size, and the derricks are capable of lifting the heavy weights which are met with in dealing with boilers and mining machinery. In the course of the day successful experiments were made with Lord Kelvin's patent depth recorder. The *Dunolly Castle*, which is expected to take her place in the service next month, is commanded by Captain J. L. Stanistreet.

Connemara.—On Wednesday, January 20th, the twin-screw steamer *Connemara*, built by Messrs. William Denny & Bros. for the London and North-Western Railway Co.'s service between Holyhead and Greenore, went on her official trial trip. As a result of an exhaustive trial on the measured mile, the mean speed obtained was 18·8 knots, the guarantee being 17½ knots on service. The *Connemara* is a sister ship to the *Rosstrevor*, delivered to the owners by the same builders about 18 months ago, and which has so successfully performed the service between England and Ireland. The trial went off without the slightest hitch, and after the measured mile trials the vessel proceeded down the Firth on a several hours' cruise. This vessel is considerably over 300 ft. in length, and has a high guarantee rate of speed.

Casuarina.—Lately the suction pump hopper *Casuarina*, built by Messrs. Fleming & Ferguson, Limited, shipbuilders and engineers, Paisley, completed her speed and dredging trials. The latter were carried out on the bar at Irvine, and the powerful centrifugal suction pumps with which the vessel is equipped were found to be capable of raising 900 tons per hour of solid and gravel from a depth of 35 ft. On her loaded speed trials she maintained a mean speed of fully 10 knots. The dredger is fitted with a direct-acting centrifugal pump by Messrs. J. & H. Gwynne, of London, and is provided with their special arrangement for conveniently bringing suction pipe inboard. Hopper doors are raised and lowered by the builders' improved steam winches. The *Casuarina* has been built to the order of the Queensland Government for work at Brisbane harbour.

Osborne.—Lately the new steam trawler *Osborne*, built to the order of Mr. Osborne, of Grimsby, has been out on her trial trip. Messrs. Cochrane & Cooper, of Beverley, being the builders of the hull, and Messrs. C. D. Holmes & Co., of Hull, supplying the machinery. The *Osborne* has been fitted with engines of 40 N.H.P. Steaming down the Humber and out to sea the vessel's speed and sea-going capabilities were thoroughly tested, the result being satisfactory to all concerned.

Miscellaneous.

Library Catalogue of the Royal Naval Engineering College. 1896.

From the Library Committee of the above Institution we have received a copy of their catalogue, which has been compiled in consequence of a determination to re-organise the library as resolved a couple of years ago. The committee appointed for the purpose had the assistance of Mr. A. Cotgreave in their labours and had the advantage of his advice in arriving at their plan of action, which, in the making of a catalogue, is almost a more important point than it is in other concerns of life. The plan adopted here is to divide the volumes into eight classes, each distinguished by its own letter. The volumes then bear both their individual number, and also their class letter. In addition to this subdivision the use of heavier type for important works is also introduced, and there are many cross references, most books appearing both under the author's name and under the title also. The library is not yet a very large one, though it is evidently growing, and much pains are being taken to increase it. At present it contains some two thousand volumes. Half of these were supplied by the Government, being the number which is usually supplied to a first-class warship. Then there was the addition of the library of the Training School on board H.M.S. *Marlborough*, which came to the college as a kind of legacy when the school ceased to exist, and a number have been added by private donors, amongst whom must be reckoned the Royal United Service Institution and the Navy Records Society.

Chaplin's Koh-i-noor Self-lubricating Packings.—For many years past Mr. G. H. Chaplin, of 12, St. Helen's Place, Bishopsgate Street Within, London, has made a speciality in the manufacture of self-lubricating packings for use in steam glands, pumps, or hydraulic appliances. These packings have been sold under the distinctive title of the Diamond Packings, by which name they are well known. They will, however, now be sold with a registered trade mark, of which the word Koh-i-noor forms an essential particular. It is claimed that these packings, besides being self-lubricating, retain their elasticity in the glands, they never get hard or become injured by the heat, and are warranted not to cut or groove the rods. From the long endurance of the packing in good working order it will compare very favourably from the standpoint of economy with any other packing on the market, in spite of its high price. It may be mentioned that the packing is quite impervious to the action of either hot or cold water, and will give equally satisfactory results when used in glands with steam under the highest pressures or with water as in feed pumps, stern glands, or hydraulic appliances. The packing is made in three different qualities, the best quality being for use in the highest pressures of triple-expansion engines, and it is interesting to note that this is the packing that has been used on the steamship *City of New York* in her recent successful running. The second grade is for use in pressures up to 100 and 110 lbs., while the third grade is for pressures up to 60 lbs.

Marine Engineers Examination.—At the examination held on January 12th, 13th, and 14th, Mr. Wilson, of Sunderland, and Mr. J. M. Brown, of Newcastle, succeeded in obtaining the Extra First Class Certificate of Competency. They were prepared by Mr. W. H. Thorn, 5, Waterville Terrace, North Shields, and make 6 successes in this grade from the above establishment.

"Inflammable Gases on Shipboard."—As arising out of the discussion which took place at the lecture delivered to the Shipmasters' Society by Professor Clowes on 21st inst., our attention has been directed to the stress which was laid upon the need for proper ventilation of the ship's hold, apart altogether from the adoption of suitable lamps, &c. Professor Clowes stated that "there was required on shipboard some mechanical system of ventilation," and it appears that an invention has recently been patented by Mr. James Casey, marine engineer, with this object in view. It is an adaptation of the principle of his new globular watertight bulkhead doors, to which attention was directed in our columns some months ago. The globular door can be applied in addition to, or in substitution of, the ordinary deck openings, and can be closed *instantaneously* by a lever, the valve-like movement being a special feature. It is thus possible to allow the gases to escape through the deck openings whenever required without running the risk involved by taking off the main deck hatches at sea, and thus perhaps in bad weather shipping large quantities of salt water. There is also an obvious convenience in this ready means of getting in and out of the hold, but as a means of ventilation—the contrivance being placed if desired under each of the ordinary ventilating cowls—the system seems worthy of consideration not only by shipmasters, but shipbuilders and marine engineers, since no one seems to have questioned the statement of Professor Clowes that "in bad weather the shifting of cargo or any slight movement which would tend to break up coal would tend to liberate the gas which was imprisoned in small pores or spaces in the coal."

Feedwater Heaters and Evaporators.—On Monday evening, January 25th, the members of the Hull and District Institute of Engineers and Naval Architects assembled at the Institute Rooms, Bond Street, to hear Mr. D. Quiggin, of Liverpool, read a paper on "Evaporators and Feedwater Heaters, with results of some Trials," the President, R. Pawley, Esq., being in the chair. The paper was a most interesting and instructive one, and amply demonstrated the need of feedwater heaters and evaporators being fitted on almost all present-day steamers. A number of carefully-prepared diagrams illustrated the chief points of the paper. A good discussion followed in which the following gentlemen took part:—Messrs. R. Pawley, E. Tindall, W. B. Dixon, A. H. Tyacke, J. B. Hutchinson, A. N. Somerscales, W. H. Brodrick, and G. H. Strong. At the close a hearty vote of thanks was accorded to Mr. Quiggin, and special thanks given for the trouble he had been at in preparing the paper, and for travelling down to Hull specially to read it.

Messrs. Blackwood & Gordon.—We are in receipt of a useful New Year's compliment from the above firm in the shape of a large blotting-book, which is rendered picturesque by series of photographic prints from various types of vessels built by their firm, and is rendered valuable as a hand-book of reference to shipowners, masters, &c., by easy arithmetical rules for ascertaining approximately the "displacement," "statutory free board," "stability," "tonnage," and theoretical consumption of Welsh coal, with triple-expansion engines, under all probable circumstances. This would be a useful adjunct to any shipowner's desk.

Holzapfel's Compositions. — The frequent explosions of composition paints in ships' store-rooms causes some importance to be attached to the notice we have received from the Holzapfel's Composition Co., Limited, of Newcastle-on-Tyne, that they having realized for years the danger attaching to such solvents as petroleum spirits, naphtha, benzine, &c., have always, and still manufacture their sea stock paints only with solvents of an absolutely harmless character. This has been proved by the fact that during their enormous supply of paints for the last ten to twelve years, a supply which has amounted in the year 1896 to nearly five million tons gross of shipping coated by the compositions of this firm, no explosion has ever taken place with their goods. The sea stock supplied by them can be kept at ordinary temperatures, in confined spaces with perfect safety.

The General Electric Co. are not to be left behind in the interchange of the New Year's season compliments, but are otherwise very much to the front with a most artistically arranged album, comprising photographs of their directors and staff principals, with the interiors of their very numerous departments, workshops, showrooms, and offices in London, Manchester, Hammersmith, Birmingham, Newcastle, and Glasgow. This album gives a graphic idea of the very numerous skilled and scientific staff employed by this company, and the marvellous organization required to build up and keep in hand departments of such varied character, and works at such widely distributed centres. The customers of this firm can testify as to the success of this organization, and its results in prompt attention and good workmanship.

Road Motors.—It is anticipated that the market for road motors will be a brisk one shortly, and Mr. Sidney Straker, of 139, Cannon Street, London, has advised us that, having extensive works at his disposal, and a large and valuable experience to our knowledge, of oil motors, he is prepared to meet any demands up to 40 engines per month of the small or horse-power type for road traction. To place his manufactures more clearly before his customers he has issued an illustrated catalogue of various types and powers of small self-contained and balanced oil motors from ¾ H.P. to 6, with accessories necessary to adapt them to road vehicles. We understand that on and after January 14th an elegant vehicle, propelled by a Straker motor, will be placed on the road by Mr. Straker as a sample of English design and workmanship, and embodying what Mr. Straker considers the essentials of a good road auto-carriage.

Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships, from December 3rd, 1896, to January 7th, 1897.

27540	H. C. Capel and T. Clarkson. Boiler furnaces.
27556	J. O. O'Brien (La Société anonyme l'Industrielle, France). Steam generators.
27573	E. A. and H. Sandford. Water-tube boilers.
27602	H. C. L. Holden. Internal combustion engines.
27603	H. C. L. Holden. Internal combustion engines.
27610	W. Wilkinson and S. Taylor. Steam boilers.
27611	W. Wilkinson and S. Taylor. Steam boilers.
27643	A. G. Southby and W. T. Ramsden. Burning fuel for steam.
27650	W. Thomson. Navigational sounding machines.
27668	Caddy & Co., Limited, and W. W. Melville. Furnaces.
27731	J. R. Wingate-Shearer and W. Peverley. Screw-propeller.
27741	M. Paul. Steam engines.
27746	M. H. Skelt. Rotary steam engine.
27766	T. Moy. Boilers.
27773	A. S. F. Robinson. Governors.
27787	R. Sauerbery. Mechanical furnace stoker.
27802	G. J. Hone and A. F. Hills. Crane gear.
27830	W. E. Buck. Friction clutches.
27831	C. D. Holmes. Propeller shaft pliable metal sleeve.
27913	P. Jensen (F. Rockstroh, Germany). Water-gauge shields.
27939	T. Wrightson. Discharging cargo from boats.
27967	W. H. Stevenson. Compasses.
27991	J. Eshelby. Ships' compass course corrector.
28004	G. V. Piper. Boat-lowering tackle.
28013	C. Mansell. Marine locomotion.
28032	G. Weston. Screw conveyors for cargo.
28053	T. Clarkson and H. C. Capel. Steam engines.
28056	W. P. Thompson (W. W. Jackson, ———). Valves.
28084	A. Ulrich. Engines.
28091	F. M. Rites. Valve mechanism.
28095	F. C. Dyckhoff. Boiler-feed apparatus.
28113	F. Moore. Tubes.
28156	J. C. Merryweather and C. J. W. Jakeman. Boilers.
28161	J. B. Hope and T. W. Sanders. Protecting gauge glasses.
28238	J. A. and S. Fletcher. Pressure gauge.
28320	J. Thom. Heating feed-water.
28349	L. Lloyd. Ships' anchor.
28433	J. Linkleter. Ships' bulwarks.
28436	J. G. and E. G. Fiegehen. Cranes.
28486	G. Beeching. Trawl boards.
28492	Galloways, Limited, and J. H. Beckwith. Tube flanges.
28493	F. J. and A. F. Tinker. Ships' bed.
28514	T. Tomlinson. Internal combustion engines.
28527	J. Mackenzie and J. Carling. Engines.
28545	E. Burwick. Valve.
28555	J. Easthope. Steam generators.
28563	J. Kirkaldy. Steam generators.
28597	H de la C. Travers. Boat gear.
28601	C. Hibberd. Collapsible boats.
28604	C. M. Johnson. Rotary engines.
28605	J. Whitehead. Pressure-reducing valves.
28621	M. Preston. Rowlocks of boats.
28635	J. G. Garrick and A. Webster. Bulkhead doors.
28646	E. Dagnall. Internal combustion engines.
28668	A. S. Cartwright. Valves.
28689	A. B. Mendelssohn. Boat launcher.
28699	E. Appleton (G. Appleton, Algeria). Ships' hatchways.
28746	H. N. Garrett. Furnace doors.
28748	F. A. Gardiner. Boilers.
28755	C. Odinet. Propelling vessels.
28778	W. M. Huskisson. Boiler tubes.
28792	J. Kay. Valve gear arrangement.
28800	W. and J. McIntyre. Frictionless packing.
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29031	W. P. Hoskins. Ships' furniture.
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29086	Galloways, Limited, and J. H. Beckwith. Shut-off valves.
29091	J. Thomas. Water gauges.
29100	H. H. Lake (R. Archibald, Vancouver). Lifebuoy.
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29184	E. G. Barnes. Boats.
29194	W. G. Wilson and P. S. Pilcher. Boat sails.
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29528 A. and C. Musker. Steam generators.
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29560 H. Alexander. Valves.
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30136 H. Pound. Wrenches.
30141 W. Brothers. Steam boiler furnaces.
4 J. Rigby. Lubricators.
44 E. P. Davis. Furnace fire-bars.
93 W. J. Coats. Cowls.
95 E. Dagnall. Internal combustion engines.
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136 J. T. M. Hircock. Valves.
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189 W. L. Gilder. Furnaces.
205 J. B. Prudhon. Mechanically propelled ship.
216 G. F. Jarvis. Water-tube boiler.
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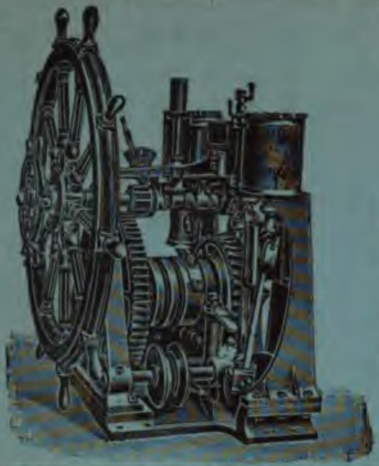

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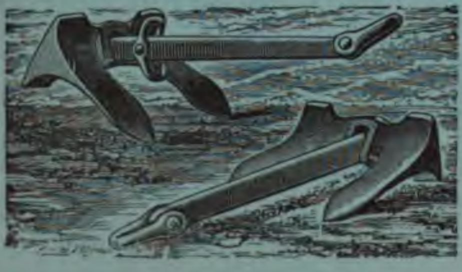

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The Marine Engineer.

LONDON, MARCH 1, 1897.

THERE is a general feeling amongst the shipping world that liquid fuel has a future before it, and yet it has made no appreciable hold upon the general mercantile navy beyond the isolated cases in which a local supply has induced local use, such ason the inland seas and rivers of Russia, where the results have been highly satisfactory. We see also that locomotives with liquid fuel supply are in daily use on the Great Eastern Railway, where the locomotives so supplied always keep good time, and have no drawbacks that we are aware of. The paper therefore, by Mr. R. Wallis, upon liquid fuel, communicated to the North-East Coast Institution, on February 10th, should be a matter of considerable interest. The writer first points out the chief sources of oil fuel, of which the principal appears to be Southern Russia, where the residuum from the evaporation of the lighter oils from Russian crude petroleum is known as "astatki." But in addition to the enormous supply of crude oil from the wells of Pennsylvania, oil deposits have been found in many countries, some of which are now producing petroleum in large quantities, such as Peru, Burmah, Sumatra, and Baluchistan. From Russian oil about 17 per cent. is oil fuel, which would otherwise be a waste residuum, and is therefore to be obtained at a very cheap rate. Mr. Wallis gives an excellent comparative table, both practical and theoretical, of the thermal efficiency of crude and refuse petroleums, and of the various coals, in which we see that the calorific value of crude, and even refuse petroleums, range per lb. from 19,000 to 27,000 thermal British units, whilst the best Welsh coal does not give per lb. more than 14,470 British units, and 98 samples of average British coal does not give a mean of more than 13,968 units. When it comes, however, to evaporation, the actual and practical efficiency of crude or refuse petroleum is found to be 13 to 16 lbs. of water from and at 212 deg. Fahr., whilst that from best coal is known under such conditions to be not more than 7½ to 9 lbs. of water. Thus, in practice liquid fuel scores a value for evaporation, as compared with coal, of 2 to 2½ times the value of the latter, which is more than appears from its actual theoretical higher range of calorific value. How is this to be explained? Mr. Wallis, we think, shows the why and wherefore most excellently in pointing to distinct points of advantage to liquid fuel, as compared with the use of coal in boilers. First, the combustion of the liquid fuel is complete, whereas, that of coal is not, consequently, in the former case there is no lost fuel in smoke or soot. Second, with oil there are no ashes or clinkers, and no loss of heat in cleaning grates whilst cold air is passing through the boiler. Third, the boiler tubes are always free, with oil, from soot, and are therefore always clean and in best condition for the transmission of heat. Fourth, the temperature of the gases allowed to escape to maintain a natural draught may be much less with oil, viz., 400 deg. to 450 deg. Fahr., there being no solid mass of fire through which the air has to be drawn, which requires in the case of coal from 600 deg. to 700 deg. Farh. Fifth, the admission of air in oil furnaces being under complete control, and the oil being burnt in fine diffusion, only a very small excess of air above that actually necessary for complete combustion really passes through the furnace, whilst in coal furnaces it is well-known that nearly twice the amount of air that is necessary for complete combustion has to be passed, to prevent smoke and keep a bright fire. Under these various heads of gain to liquid fuel as an evaporator, the extraordinary increase of efficiency to liquid fuel of from twice to 2½ times that of coal, which is established on undeniable facts, is well explained. If only then a double efficiency per ton of refuse oil is allowed, as compared with coal, the indirect economies and advantages resulting from the use of liquid fuel on board ship are obvious. Firstly, assuming the stowage bulk of one ton of oil to be equal to that of coal, the bunker space required for oil is only half of that for coal for equal evaporations, and there is no lost space by the projections of frames, stringers, or beams. Also portions of the ship which would not be accessible as coal bunkers may be used as oil bunkers. Secondly, there is no trimming required for filling up bunkers with oil, and by the control of distributing valves there is no risk of the vessel heeling whilst loading bunkers, a risk which has lately been ominously forced upon shipowners whilst loading with coals. Thirdly, in the matter of stoking, the sprayers for oil require very little attention after once they are adjusted, and one man can attend to a large number of furnaces without exhausting toil. There are no ashes or dirt to remove, so that the stokehold staff could be reduced to one man for each watch. There are no firing tools to repair or supply, or firebars and floor plates to renew, and the absence of smoke and dirt enables the ship to be kept cleaner. With all these advantages it is a marvellous thing that more has not been done in the introduction of liquid fuel to some of our regular sea-going steamers. Mr. Wallis gives particulars and designs of the various types of oil-burning furnaces, and particulars of practical results, of which he is cognizant, and the whole paper is of great interest and value to those desiring information on the subject.

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WE illustrate in the adjoining diagrams a new design high-speed vertical engine, which has been specially constructed for driving electric light installations on gunboats, steamers, and other vessels; and also for mills, factories, collieries, etc.

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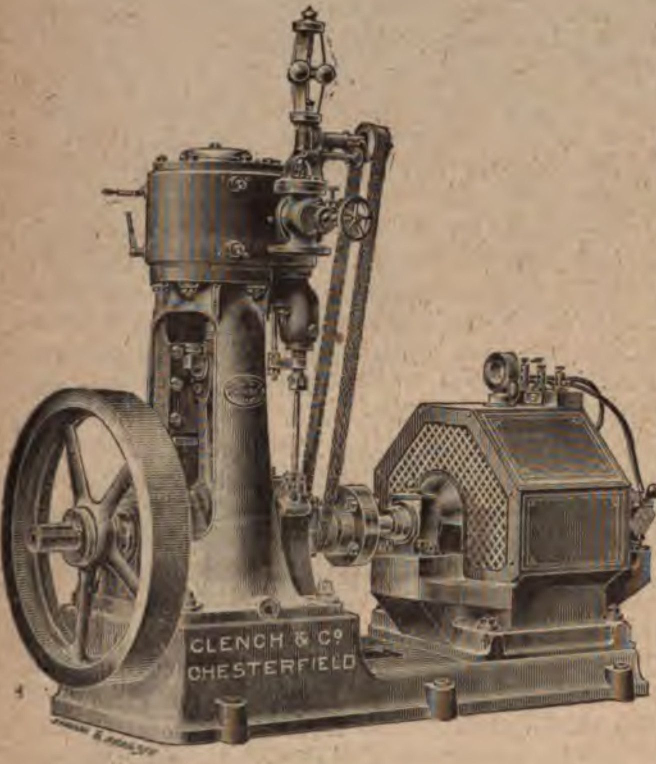
The forged steel crankshaft, main bearings, and all the wearing surfaces are much larger than usual, so as to be strong enough for giving off 30 per cent. more power—size for size—than those engines made from old-fashioned patterns.



The distribution of steam in the cylinder is effected by a piston slide valve, driven from an eccentric on the crankshaft. The governor is of the Pickering type.

To facilitate continuous running special attention is paid to the lubrication, all revolving parts being served by centrifugal oilers.

Several of these engines are designed so as to run at 450 revolutions per minute, which enables electrical engineers to tender for complete plants with smaller dynamos than would otherwise be available. Engines made from old-fashioned patterns are not strong enough to work steadily at this high speed.

The front of the standard is removable by simply unscrewing four nuts, so that all the working parts are readily accessible, and the crankshaft can be removed when required.

These engines are made in eighteen sizes, varying from 5 to 80 brake H.P. When higher powers are required, two engines are coupled together on one baseplate, so as to give double the power of the single ones.

Messrs. Clench & Co. are also makers of compound high-speed vertical engines, and we understand they are now building three large engines of this type, for driving the electric light installation at the Blackwall Tunnel, for the London County Council.

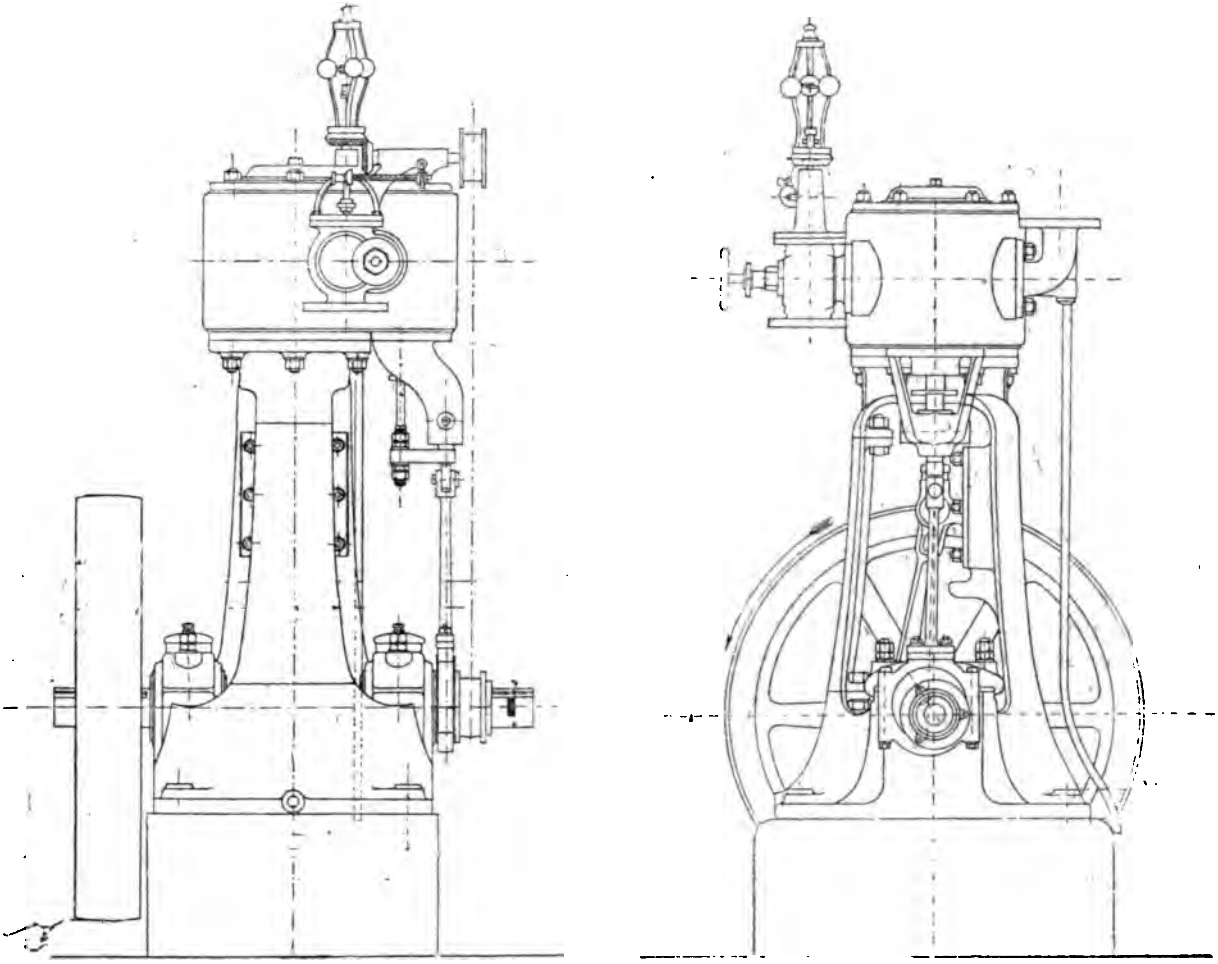
The prices are decidedly moderate, considering the advantages secured, but for this and other particulars, we must refer our readers to the firm at Chesterfield, or their London Office, 24, Queen Victoria Street.

A TRADES UNION LEADER ON THE OUTLOOK IN MARINE ENGINEERING INDUSTRIES.

MR. JAMES SWIFT, the general secretary of the Steam Engine Makers' Society, in his introduction to the seventy-second annual report of the above organisation, remarks, that whilst able to submit an exceptionally favourable record as to the finances and membership, a brief survey would show that good results had been arrived at while dealing with wages and other conditions on which members disposed of their labour. "These results," he then proceeds, "as a whole have not been equalled within the past twenty to twenty-five years, inasmuch as wages have now been advanced as a rule two shillings per week beyond the minimum at any period since 1875. In the interval there have been fluctuations, as during bad trade employers combined, enforced a general reduction, and *after that* individual employers screwed a little more out of individual workmen on new engagements. In the last depression, however, an exception was made, as outside marine centres no reduction has been enforced in artizan engineers' wages since 1886. This was not from the want or desire on the part of some captains of industry, as rumours of reductions were numerous, whilst in single cases the attempt was made to put it in force, but without effect. The cause of this we contend was extended combination, and the certainty of a strike, if any attempt was made to interfere with the limited wage of a class of tradesmen who are not now overpaid for the skill required in engineering industry.

"As we have said, no general advance on the minimum wage has been effected for near a generation, and those who have had to deal with it in recent cases, know that it has required an amount of tact and firmness to bring about such a desirable result without resorting to hostilities. Many would have done this in the first instance, and asserted their power and that of their combinations. Fortunately, however, there are those in every district with mature experience, who in the past held vigorous views, put them in practice, and by results, could now give opinions that were worthy of attention in such important matters. The result has been that the workman's position has been improved, amd that at little cost for strike pay. There were exceptions, where individual employers did not acknowledge the position, who at any time look upon the workman as a mere creator of wealth, but must not participate in any of the results, other than a weekly pittance that will keep the frame in order, and they (the employers) to have all the luxury or pleasures which the created wealth would purchase. Others seemed to infer that they should be allowed a (lower) differential rate to their competitors, and these not being agreed to, conflicts took place, but rarely exceeded a few weeks before favourable settlements were made, and the men back at work.

"Such has been the result in inland towns, but in marine districts, the position has been different. During the times of depression, the numbers of unemployed being so numerous, reductions were enforced, and in one centre the full amount of such reductions (owing to an ill-advised time agreement) has not yet been recovered. In others, the reverse has been the case, and at least the old rate of wage established. This, however, has not been effected without ominous threats being made as to retaliation, so that it is our bounden duty to carefully note, and if possible be prepared for such an attack, should it be made in the future. Ample evidence of this was given by what was going on at Belfast and Glasgow at the commencement of 1896. One district asked for an advance, and thousands of men were locked out in the other district by the mandate of an employers' federation just previously formed. Later on in the year another large centre threw in their lot with the said federation, with the result that whenever any trivial matter arose an instant threat was made of a general lock-out, which, if enforced, would affect numbers of families too numerous to conjecture. Some of the bolder spirits amongst the men treat this federation of employers quite lightly, but example shows that all other newly-formed trade unions are eager for a contest, and whilst we may expect this extensive employers' federation to stand together for defensive purposes whilst trade is good, we must also expect them to be aggressive so soon as slackness shows itself.



Clench's High Speed Engines. (Sectional Elevations.)

"Beyond this, new local employers' associations are numerous, whilst evidence is not wanting of ardent advocates desirous of federating even these for offensive and defensive action in inland towns. Such being the case, it is very essential that every care should be exercised in dealing with trade matters, and whilst trade is good, only make such claims as can be defended when there is not such a briskness as at present exists. Above all, the funds should be carefully guarded, built up as much as possible in the meantime, and no factious dispute entered into that not only wastes capital, but weakens the fighting powers of the men, as these should only be brought into action when a real benefit is to be struggled for. Past results show the need of this. As years go on ordinary claims upon the society increase, whilst two years of bad trade, as a rule, swallows up the savings of four years' good trade. Hitherto we have passed through these depressions without taxing members by extra contributions. This position we must make it our object to maintain. We must guard the finance, keep our unemployed in mind when vacancies offer themselves, and be true to the affirmation, "Assist a member in time of need," but consistent with reason and a good object in view.

"By the present outlook, 1897 will (unless some unforeseen cause arises), register a less unemployed list than the year just closed. Numerous causes point to this. The increased exports of engines, &c., in 1896 amounted to £509,349 above those for 1895 and machinery £1,377,028. Whilst our exports are expanding, home industries are extending. The electric light, which was in embryo a quarter of a century ago, is now a leading industry, and finds extended employment for members. War vessels, ordnance work, and engines of destruction (which, we devoutly hope, will never need to be used), come in the same category, and the cycle trade is an important factor, that, by present appearances, may eventually be equalled by motor cars or vehicles at no distant date. The tonnage of vessels launched in 1896 (1,326,822 tons) is the highest on record. 1897 bids fair to even exceed this, as without including war vessels, there are at this date 390 vessels of 784,711 tons now under construction. These causes have made a demand for members that has been in excess of the supply, and at the time of writing we have less than ½ per cent. of unemployed members in receipt of donation in the United Kingdom, whilst offers of vacant situations are of daily occurrence. So long as this prosper
funds must increase, and it is to be hoped t
members will adopt a like course, and inc

as even a limited banking account makes a man self-reliant, and the possessor of a spirit of independence, rather than act the part of a serf to a hard and callous taskmaster."

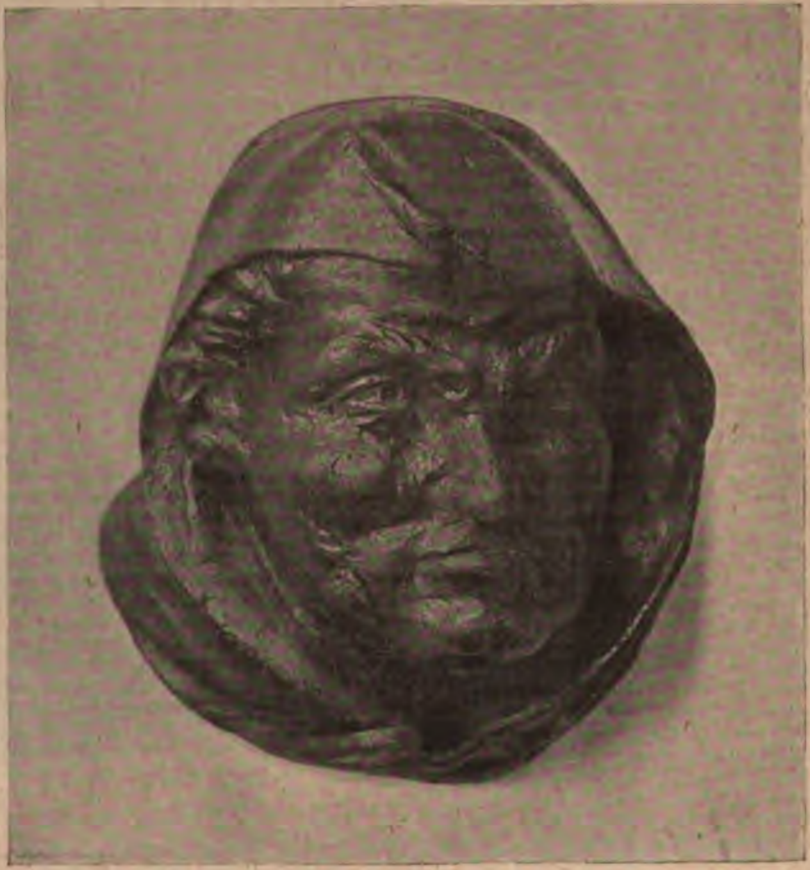
THE APPLICATION OF WOOD-CARVING TO SHIPS' DECORATION.

ALTHOUGH the question of ship decoration can perhaps hardly be called marine engineering, yet at the same time many of our readers must be greatly interested in and intimately connected with this branch of shipbuilding, it is therefore with pleasure that we take the opportunity of describing one of the most remarkable processes for the reproduction of wood-carvings in wood pulp that have recently been brought forward. While visiting the offices of Mr. Leslie Robinson, of Westminster, in reference to some information about the well-known Normand water-tube boiler, we saw lying on his table, some specimens of wood-carving reproduced by this process, and at our request Mr. Robinson kindly permitted us to photograph one of them for the purpose of illustrating this article. Although it is but a small specimen of carving it is sufficient to show anyone who is conversant with this class of work, the great points of excellence possessed by this process.

The ordinary method of producing wood-carvings where machines are employed, is no doubt too well-known to most of our readers to need much, if any explanation. The usual method adopted is to rough out the carvings, or to cut away all the heavier part of the cutting that has to be done in the machine, leaving the work in a more or less rough state, which has subsequently to be finished off by hand. This means, of course, that all the artistic part of the work has to be done by a very expensive process, that of hand carving.

As a rule, undercut work cannot be attempted by ordinary carving machines, and this all has to be done by hand after the work leaves the machine, which naturally renders any carved work with heavy undercut work, a very costly matter, and one of the strong points of the process now under our consideration is that heavy relief work can be produced at the price of a third or a quarter the cost of a similar article in ordinary wood carving. The importance of this to a large shipbuilding or shipowning company, who has a distinctive mark, crest, or monogram that they wish to incorporate in the design for the decoration of their ships can easily be imagined. They can reproduce them in quantities at very much less cost than in wood, and at the same time procure a much more artistic pattern than could be done in ordinary wood-carving, except at a very large outlay.

On asking Mr. Robinson how this process was



THE APPLICATION OF WOOD-CARVING TO SHIPS' DECORATION.

carried out, he replied that he was not at liberty at this stage to divulge exactly how they were produced, but we understand that they are made from actual wood-carvings, of which a mould is taken, and the wood pulp is then pressed into the moulds. All the processes for dealing with wood pulp that have as yet been brought under our notice have always been remarkable for the blurred or rounded off appearance of the carving, a complete absence of undercut work, and clean cut or straight edges. The well-known Lincrusta-Walton and papier mache processes have been most effectively used for ship decoration, and this process, though not covering the same ground as the Lincrusta process, should be a valuable adjunct to them, as they excel in flat frieze or panel work, whereas the present process is "par excellence," suitable for heavy relief and undercut work.

Its applications are almost endless, but amongst the more prominent, we might mention heavy relief panel work, balustrades, statuettes, column heads, etc. One branch we might say, where it can be particularly effectively employed, is that of electric light and electric bell fittings. Every architect knows how difficult it is to get suitable fittings to harmonise with various styles of decoration.

Although the material is not wood in the ordinary acceptation of the word, yet it has every appearance of wood, and when combined with, for instance, walnut panelling, it is impossible to distinguish between the two. It works exactly like wood, but has the further advantage that it will not split, chip, or crack. The process is a French one, and the artistic taste displayed does great credit to the inventor, in fact we have rarely, if ever seen a system with which more beautiful and artistic effect can be produced for a given outlay than the process under consideration.

PARTIALLY IMMERSED SCREW PROPELLERS.

A PAPER on partially immersed screw propellers for canal boats by Mr. Henry Barcroft, of Newry, was read at the annual general meeting of the Institute of Mechanical Engineers held in the theatre of the Institution of Civil Engineers.

The author dealt first with the question of screw propeller action, and claims that, as no part of the surface of his screws exceeds an angle of 45 deg. with the beam of the vessel, "a greater percentage of efficiency is obtained than with the ordinary screw in which a considerable area of blade near the boss has an inclination greater than the right angle." He points out that these partially immersed propellers have no influence on the steering when placed 34 ins. out of centre. The lighter *Agnes*, when one of the propellers was taken off, kept a perfectly straight course, steaming only with the remaining one.

He then goes on to the question of size of screw. In the screws he has applied to barges "the large diameter enables the large blade to be cut off as soon as the angle reaches 45 degs., while yet retaining blade surface enough for operating on a sufficient quantity of water to minimise the slip, which is so excessive in a small screw of high velocity driving a slow and heavy boat."

The author devotes the rest of his paper to the consideration of the question of waterway, and the effect that the restricted channel has on the propulsion of the boat. He points out that the propeller of a boat, when moving freely in open water, may have an ordinary percentage of slip, but as soon as she enters into a confined section of waterway her progress becomes slower though her propellers may be making almost as many revolutions.

The reason for this is that there is a backward current induced by the forward motion of the boat. "In this current the boat floats and is carried with it, just as she would be if stemming or ascending the current of a river, or if moving against the tide in an estuary. In order to understand the decline in progress of a boat when in a narrow waterway, it is necessary to realize that this current of displacement is passing sternwards, and that as the boat floats in the current she must be subject to its influence and must be carried aft bodily at its velocity. Her progress through the water may remain as in open water or nearly so; but her progress over the ground will be no more than her open water progress minus the velocity of the induced backward current." The apparent slip is firstly the open water slip, and secondly the velocity of the displacement current which is dependent upon the difference between the cross section of the boat and the cross section of the waterway.

On some shallow canals ordinary screws are used, and it is not uncommon to find that when the pitch and revolutions give say 10 miles an hour, the actual speed of the boat is only three, and with the displacement current added, a speed of not more than 4 or 4½ miles an hour can be accounted for.

Part of the loss the author thinks should be attributed to the violent rush of water which shoots away from an ordinary screw; but if the screw could be made sufficiently large so that the water should travel aft no faster than before, there would still be a loss due to the head of water in front of the boat. The sources of disappearance of power are therefore two: that absorbed in heaping up the water in front of the vessel, and the friction produced by the sternward current kept in motion by this head.

The new partially immersed propellers are so large that the water acted upon refuses to move backwards and the power is exerted almost wholly in moving the boat forward. This, he thinks, is the explanation of the fact that no wash is observed on the bank when his propellers are at work.

The author refers, in concluding his paper, to the objections which were taken to the partial immersion of his screw propeller owing to the loss of efficiency due to air being drawn down. He doubted very much if this loss was due to that fact; he thought it was due to part of the propeller being out of the water and the blade ceasing at that moment to act as a propeller.

At the conclusion of the paper the President called upon Mr. Thornycroft to open the discussion. Mr. Thornycroft, however, said that he should prefer to defer his remarks until Mr. Barnaby had spoken.

Mr. Sydney Barnaby said that he was very much obliged to Mr. Thornycroft for allowing him to say what he had to say first, as he knew, if Mr. Thornycroft had spoken, there would be very little left for him to talk about. A good deal was said as to the comparative merits of large and small screws. Large and small were, however, only relative terms. Having regard to the resistance of the canal boat and the speed of propulsion, about 3½ knots, he should not call a pair of 4 ft. 10 in. screws large even if they were fully immersed; but partially immersed, as they were, he should call them very small screws, and he was surprised they propelled as well as they did. He took exception to the statement that with large propellers the water refuses to move away backwards. All that can be said is that a larger amount of water is moved at a less speed.

As to the wash on the bank of the canal he should think the form of propeller used would have very little influence upon it. It must surely depend upon the form of the boat and the speed at which it is driven. If the speaker had a patent propeller he would never claim that it reduced the wash upon the bank of the canal, as he thought it could only do so by driving the boat slower than the screw it replaced. He would, however, like to design not only the screw but the barge as well if he wanted to reduce the wash on the bank; indeed, he would like to have had a finger in the cutting of the canal also. As to the effect of air being drawn down, he could speak with some authority, having a few years ago assisted Mr. Thornycroft in making a number of experiments with screws, some of which were for the purpose of determining this very point. It was found that the effect of air was very great indeed, and far more than could be accounted for by the reduction of area due to the partial emergence of the screw. In these experiments the relation of the power used for driving the screw to the thrust delivered by it was greatly changed by the admission of air. The same effect, although to a less extent, was obtained without lifting the screw out of the water at all. It was only necessary to convey air to the propeller by means of a tube from the water surface. The thrust of the screw fell off at once. The submerged screw propels partly by thrusting water away, and partly by drawing it towards the forward face of the blade. To do the latter the pressure of the atmosphere must be called into play to assist the pressure due to head of water over the screw, otherwise the speed of the water flowing to the screw is small. If air be admitted to the screw blades the atmospheric pressure is balanced, and that due to head alone can operate. The screw blades act then like the floats of a paddle wheel and propel almost entirely by thrusting. A paddle wheel should have its propelling surface much larger than that of a screw to give the same thrust and the same efficiency, and therefore if partially immersed screws were used for any but very slow speeds they should be considered to be inclined paddle wheels and should have a proportionally larger surface. At a depth of 1½ ft., which is the mean depth of immersion of the author's screws, water will flow at a velocity of

$$\sqrt{29\,h}$$

or about 6 knots. As this is above the velocity with which a portion of the blade below the water level moves through in the case of the *Tyrone*, very little if any air will get down. He was quite prepared to believe that the author suffered very little disadvantage on this score, and that his screws were much more efficient than would at first sight appear probable.

Mr. Thornycroft said there was one point he should like to speak on, and that was the displacement current. He thought that Froude's work was so well known that it was unnecessary to dwell upon it now. If he might be allowed to continue the water-line of Mr. Barnaby's diagram on the black board he would illustrate this point. The author had said the water was piled up in front, and that was so, but he quite spoilt Froude's diagram by leaving out the following current, which must not be ignored. He quite agreed with what Mr. Barnaby had said as to air getting down, but it must be remembered that at high speeds a different state of affairs prevailed: personally he had not had much experience of speeds of two miles an hour. He had seen a boat with an inclined paddle wheel which was something between a screw and a paddle. He himself had designed (some years ago) a screw tug-boat for a canal. Perhaps it was rather expensive, but, however, it was not accepted. He was informed afterwards that the directors had decided to put in donkey power as they cost practically nothing to keep, picking up all they wanted as the boats passed through the locks. He had designed some boats for the Bridgewater Canal where the water is only 3 ft. deep, and had put in a screw 5 ft. in diameter. This was reported upon by a local engineer, who said it would not work, but since then he had found it would.

Mr. Wicksteed said he had made a trip on the *Pioneer*, which is fitted with these adjustable propellers during the Belfast meeting last year, and he had a very good opportunity of studying the action of these propellers in the water. They entered it without a splash.

With regard to the employment of submerged and partially submerged propellers, Mr. Wicksteed thought that a larger cross-sectional area of blade would be obtained with a partially immersed propeller than with a totally submerged one, both being immersed to the same depth.

He thought that most probably the reason why the Admiralty coefficient of 62, given by Mr. Barnaby for the *Tyrone*, was not particularly high was probably due to the absorption of power by the gearing.

Mr. Scott made some remarks upon the New-Mayne electric rudder motor, one of which was shown in the theatre. He said a high efficiency was obtained with this motor because it was cooled down by passing through the water. One advantage claimed for this motor is that the inclination of the propeller could be easily altered to prevent the settling down of the boat at the stern. They obtained their power from accumulators, but he hoped that the overhead wire and trolley might be introduced. They require 3 tons of accumulators for every 30 tons carried. The motor has a stationary armature, the field revolving.

Mr. Schonheyder said that the inclined paddles mentioned by Mr. Thornycroft were the same in principle as the skew gear used in the Sellers planing machine.

Mr. Leslie S. Robinson said that he had had an opportunity of seeing the boats mentioned by the author at work, and he thought Mr. Thornycroft's and Mr. Barnaby's criticism was due to the fact that they had had more experience with boats of 30 knots speed than with boats having a speed of 2 knots. With regard to the falling off of the efficiency of the screw due to air being sucked down, M. Normand had also made some tests on the efficiency of screw propellers at varying depths of immersion. He suspended a torpedo boat over the quay at Havre, with her nose against the quay wall, and took readings of the thrust with a dynamometer. No sooner did the tip of the blade emerge from the water than the efficiency curve dropped very considerably.

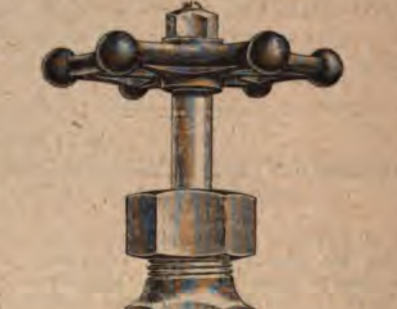
He referred to the diagrams on the wall, which showed the enormous influence that the ratio of cross section of boat to canal had upon the tractive force. For a very small decrease in this ratio the effort of traction was tremendously increased. Nearly all the speakers had given the results of their experiences in open water; but it was absolutely impossible to argue from observation in open water as to what would happen in a canal.

Mr. Barcroft, replying to the discussion, said he had not intended to put himself in opposition to generally accepted principles, as nearly all his own theoretical knowledge was taken from Mr. Barnaby's book. He was also aware of the experiments Mr. Thornycroft and Mr. Barnaby had carried out. What held good for high speeds did not, however, apply to slow speeds. With regard to the drawing down of air, that might probably occur at high speeds, but he had not experienced it at those he was working at.

Mr. Leslie S. Robinson's paper on Canal Propulsion was adjourned till the next meeting. The proceedings were then concluded with the customary votes of thanks.

MORSE STEAM VALVE.

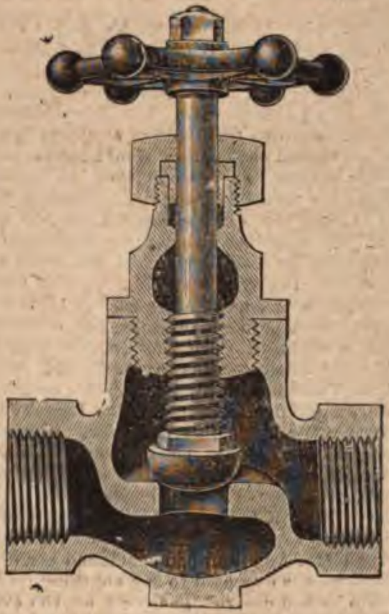
EVERY engineer knows the number of valves of different designs in use at the present day, all of which are more or less ingenious, but the one under notice will be seen from the section to be of more than ordinary merit. Valves are known to be an important item in the economy of an engine, and accidents have occurred from faulty construction that have become truly memorable. Generally these have been



from sticking fast to the seat, but failure may happen from a wrong design, or the make or quality of materials used may be equally to blame. We all know, for instance, of arrangements which wiredraw the steam by preventing its free passage, spindle and wing valves being in this category for example. If fitted with renewable seats these latter may become loose, or not being bedded level, cause undue strain on the spindle.

To obviate these defects there is nothing like the old screw-down valve, if of good strong proportions, and well and accurately finished, and it is to follow out these ideas that the makers have introduced the present method as a combination of the advantages of that system with those of the ball and full way valves. The disc is spherical, and therefore offers no obstruction to the free passage of steam. It revolves on the spindle, is readily renewable, and screwing down as it does on the edge of the seat, a tight joint is made with the least amount of friction. The edge is of course, slightly chamfered off, and the seat made double the usual thickness to allow of its being reinstated after wear. It is apparent, therefore, that here we have a valve that meets most of the objections that may be raised to the usual types, and when we add that the machining and finishing takes place at one operation, a still further proof is afforded of everything connected with it coming true.

Besides the foregoing details, which will be appreciated by engineers generally, we are assured by the makers that they make a special point of the mixture of the metals, tin and copper in their proper proportions for strength being only used, and that the valves have been tested up to 500 lbs. pressure, and therefore are capable of standing the high pressures in vogue at the present day. Another advantage this valve possesses is that it can be readily kept in order with the now well-known valve re-seating machine which is also to be obtained from the same firm, viz.: R. & I. Rankin, 22, Manchester Street, Liverpool.



LAUNCH OF H.M.S. "NIOBE."

SIR WILLIAM WHITE ON ADMIRALTY CRITICISMS.

ON Saturday, February 20th, the Naval Construction and Armaments Co., Limited, launched from their shipbuilding yard at Barrow-in-Furness, H.M.S. *Niobe*, first-class cruiser. This vessel is one of eight, six of which are being built by contract, four on the Clyde, and two at Barrow and the other two at Pembroke Dockyard. The *Niobe* is ,35 ft. in length, between perpendiculars, but the overhanging stern and the projecting ram make the length, over all, 463 ft. The breadth, over sheathing, is 69 ft., and her moulded depth to the upper deck 39 ft. 9 in. The mean load draught of the vessel is 25 ft. 3 in., at which draught the displacement is 11,000 tons. The hull of the vessel is constructed of Siemen's-Martin steel, the heavy external framing of the ends, stem, and stern post, and propeller brackets, and the rudder frame being, as is usual in sheathed vessels, phosphor bronze castings.

The rudder is of the balanced type, and the stem curved outwards under the water, so as to form a formidable ram. Up to a height of about 9 ft. above the water-line, the steel shell of the vessel is sheathed with teak planking, and coppered. Two long bilge keels, to prevent rolling, are also fitted amidships. the vessel's bottom is constructed on the cellular principle, the inner skin being carried from the protective deck at one side down, and up to the protective deck at the other side. The double bottom, or the space between the two skins, is minutely subdivided into water-tight compartments, which are partly used for the carrying of water, and which afford security against sinking should the outer skin be pierced. By water-tight bulkheads and water-tight flats the vessel is throughout closely subdivided. The protection consists of an armoured deck of steel plating 4 in. thick at the crown, which extends the whole length of the vessel. It is arched in section, rising from well under the water-line at the side of the vessel, to considerably above the water-line at the crown of the arch. Under the deck, which is raised for the purpose, in way of the engines are placed the propelling machinery, the steering engines and gear, the capstan engines, the air compressing machinery, and all the magazines, shell-rooms, and torpedo-rooms. The coal bunkers, which have capacity for over 2,000 tons of coal, are arranged along the sides of the boiler-rooms and along the sides of the vessel on the protective deck above the engines and boilers, thus affording most satisfactory coal protection to the machinery of the vessel. The armament of the vessel, as will be seen from the following, is of a most powerful description. There are 16 6-in. quick-firing guns; 12 12-pounder-quick firing guns; 3 3-pounder quick firing guns; 2 12-pounder boat and field guns, and 8 .45-in. Maxim machine guns.

The 6-inch guns are mounted as follows:— two on the forecastle head, two on the upper deck aft, the remaining 12 being mounted on the broadside in armoured casemates, constructed of Harveyed steel armour 6 in. thick. Of these 12 casemates eight are on the main deck level and four on the upper deck level.

The 12-pounder guns are mounted four an each broadside on the upper deck, two on the upper deck under the fourcastle, and two right aft on the main deck.

The 3-pounder guns are mounted on the boat platform deck.

The *Niobe* is supplied with three torpedo tubes, one of them firing right aft above the water-line, and two broadside under water-line; tubes placed under the protective deck in a special compartment forward.

The 6-inch guns, and 12-pounder guns will be supplied with ammunition through armoured tubes, extending from the protective deck to the deck on which the guns are worked.

An ammunition passage is arranged on each side of the ship, extending for the whole length of machinery space below the protective deck. The passage is completely protected by coal on top sides and bottom, so that the ammunition need never be exposed to fire in its course from the magazines to the guns.

The conning tower, from which the vessel is steered and directed when in action, is placed forward, and is built of Harveyed steel armour 12 in. thick. From it are led voice tubes, telegraphs, &c., down through a forged steel tube 7 in. thick, to the protective deck, and forward and aft underneath this deck to the engine-room. [illegible] rooms and steering positio[illegible]

Above the conning tower is the navigating bridge with chart room, steering standard, telegraphs, &c., required in the ordinary navigation of the ship.

The vessel is fitted with two steel masts, but unlike her larger sister, the *Powerful*, these are not fitted with fighting tops, but on top of main-mast pole is fitted large semaphore signalling apparatus. The vessel is fitted with steam steering gear, the engines being placed in the main engine room, and the gear aft under the protective deck. There are five steam steering positions, one on the forward navigating bridge, one on the aft bridge, one in the conning tower, and one forward and one aft, under the protective deck. Powerful hand gear is also fitted aft under the protective deck.

The vessel is lighted throughout with electricity, there being three dynamos supplying electricity to six powerful search lights, and the incandescent lights throughout the ship, which number about 850. The search lights are placed, one in special top on each mast, and two on each bridge.

The ventilation, both natural and artificial, is most complete There are four large ventilating steam fans for ventilating the main spaces of the ship, and one electric driven fan for cabin ventilation. On the deck are arranged two boat-hoisting engines and two coal-hoisting engines, heavy derricks being also fitted for hoisting the boats inboard and over the side. The boats, which are fourteen in number, and include a 56-ft. steam pinnace, and two steam launches, are stowed on a steel boat deck which extends from the forecastle to the after-bridge.

The total complement of the vessel, including the admiral's retinue, will be 718 men, for whose comfort every provision is made. The officers' quarters, which include a spacious suite for the Admiral, are arranged mostly on the main deck abaft the machinery, the crew and petty officers being accommodated on the upper deck under the forecastle, and on the main deck alongside and before the machinery spaces.

Numerous bath-rooms, wash places, galleys, latrines, pantries, and store-rooms are arranged throughout the ship in convenient positions, and every pains has been made to make the *Niobe* a first-class and fully equipped war vessel.

Description of Machinery.

The propelling machinery consists of two sets of inverted vertical direct-acting triple-expansion engines, having one high-pressure cylinder 34 in. diameter, one intermediate 55½ in. diameter, and two lower pressure cylinders 64 in. diameter, working on four cranks, the stroke being 48 in. The collective I.H.P. is expected to be about 16,500 when running 110 revolutions per minute, with 250 lbs. steam pressure at the engines. The crank shafts are in two parts of forged steel, and are 17½ in. in diameter, with a 9-in. hole from end to end. Each cylinder is supported upon two forged steel pillars at the front and a strong cast-steel column at the back, with cast-iron guide plates attached for the piston rod cross-head. The main bearing frames to which the columns are fastened at their lower end are of cast steel, and are tied together longitudinally by cast-steel distance pieces; the main bearings being of gun-metal lined with white metal. The steam distribution valves for the high pressure and intermediate cylinders are of the piston type, having adjustable packing rings and those for the low-pressure cylinders are of the ordinary double-ported flat description, fitted with large relief rings on the back. The valves are actuated by ordinary double eccentric link motion, provision being made for reversing either by steam or hand gear. Each engine has one air pump worked by means of links and levers, from the high-pressure cross-heads. A small hand pump is fitted in each engine room, arranged so that it may be driven by the main engines at any time if required. There are two main condensers, each having a cooling surface of 8,750 square feet and two auxiliary condensers each having a cooling surface of 1,100 square feet. There are four centrifugal circulating pumps in connection with the main condensers which may also be used for pumping out the bilges in the event of a leak in the hull of the ship; the combined capacity of these pumps will be about 4,800 tons per hour. The auxiliary condensers have also centrifugal circulating pumps and independent air pumps in connection with them. The other auxiliary machinery in the engine-room comprises two electric light engines and dynamos, two steering engines, two reversing engines, two turning engines, two hot-well pumps, four fire and bilge pumps, two sets evaporators and distillers, and two ventilating fans and engines. The boiler rooms are all forward of the engine rooms and comprise four separate watertight compartments, three of which contain eight boilers each, the remaining one has six boilers. The boilers are of the latest improved Belleville water-tube type with economisers, six of the boilers are composed of seven elements of tubes, twenty with eight elements and four with nine elements. Each element contains fourteen tubes, and the tubes are of solid drawn mild steel 4½ in. external diameter. The economisers are composed of six and seven elements of fourteen tubes, the tubes are of solid drawn mild steel 2¾ in. external diameter. The total heating surface in the boilers and economisers is about 40,550 square feet, the grate surface is 1,449 square feet.

The casings are built of steel plates, lined inside with bricks in the vicinity of the fire grates, and having asbestos and silicate cotton covering outside. The working steam pressure in the boilers will be 300 lbs. per square inch, which will be reduced at the engine-rooms to 250 lbs. per square inch, by means of a "Belleville" reducing valve. The boiler-rooms also contain eight Weir's feed pumps, eight air-blowing engines, for supplying the furnaces with small jets of air under a pressure of about 30 lbs. per square inch, eight forced draught fans with independent open engines, and eight double-cylinder ash-hoist engines. Two ship's ventilating fans are situated in the auxiliary machinery room aft of the main engine-rooms, a third dynamo being placed in this room. The air compressors are placed in the capstan engine-room, and the air reservoirs in the submerged torpedo-room forward. The whole of the main and auxiliary machinery will combine upwards of 124 steam cylinders. The main steam pipes and the receiver pipes on the main engines are of lap-welded steel tubes, having a butt strap riveted over the weld, and are fitted at various positions with gun-metal expansion joints. There are in all four main steam pipes between the boilers and the engine-room, which are fitted with Belleville steam separators, from which the main engines take their supply. There will be four funnels placed in line fore and aft, the height of which will be about 80 ft. above the fire-grate.

Mr. Adamson said the first toast he had to propose was "Success to the *Niobe*," the vessel they had just put into the water. This vessel was known as a first-class cruiser. Six of this class of vessels had been built by contract, and two of them in the Royal Dockyards. The Naval Construction and Armaments Co. had been fortunate in securing two of these six vessels, and the second one, as they would have seen to-day, was well in frame alongside of the one they had just launched. These cruisers, when finished, would, he believed, be the largest cruisers in the Navy with the exception of the *Powerful* and *Terrible*. At the same time they fell a good deal short of the two vessels named, the displacement of the *Niobe* being 11,000, while that of the *Powerful* was 14,200, and the H.P. of the former being 18,000, as against 25,000 of the latter. In armament, casemates, protective decks, and other features, the cruisers were much alike. The *Niobe*, he went on to say, was commenced some fifteen months ago, and had been ready for launching about three or four months, but owing to a little difficulty with regard to Belleville boilers they had thought it best to postpone the launching till now. He anticipated a speedy completion of the machinery and other fittings, and in conclusion coupled with the toast the name of Sir William White, Director of Naval Construction.

Sir William White, K.C.B., in replying, said it was quite an unexpected pleasure to him to respond to this toast. He was not aware until Mr. Adamson had concluded his description of the *Niobe*, that he was expected to say anything on the occasion. She was a ship he had designed, as well as the *Powerful*. He had with great interest heard Mr. Adamson's comparison of the *Niobe* with the *Powerful*, but he took it that comparisons were not of very great importance, because the Navy naturally embraced many classes of ships, built for many services, and while the *Niobe* was, as Mr. Adamson said, not so large and not so powerful as the ship that bore that name, yet there could be no doubt that in deciding on building these vessels the Admiralty were governed by the consideration that there was room for such a class. It was interesting to notice that, although there had been a good deal of criticism and a good deal of hard words used about monster cruisers, yet it happened that our vessels had been imitated in size and in other things at all events. Whatever advantage that might give, we were the first to take the lead in the building of large cruisers. He well remembered when he proposed the building of the *Blake* and *Blenheim* class of about 9,000 tons, about nine years ago, there was a great outcry in some quarters that such large dimensions should be proposed for cruisers, but now they had building for the French and German Navies cruisers like the *Niobe*, viz., 11,000 tons. The Russians had cruisers of 12,000 tons, and they proposed, so it was said, to have cruisers of 14,000 tons. There was one interesting fact always to be remembered, that general experience showed if they wanted vessels capable of steaming at a high speed, and maintaining that speed at sea for long periods, they must be of large dimensions, and it had always been a mystery to him why there should be such criticisms of these cruisers in the Navy, when it was remembered that even the *Powerful* and *Terrible* were small in comparison with ships in the Mercantile Marine. There appeared to be some confusion at times with regard to war vessels and those of the Mercantile Marine, and although those of the former was sometimes spoken of as having the largest tonnage, it was really less than that of the latter. Without wishing to appear egotistical, he could only say that if it had been possible to imitate in these large cruisers the dimensions and displacement which are given to many of the vessels in the Mercantile Marine, there was no doubt they could have produced much more powerful vessels. The vessels in the Transalantic service, such as the *Campania* and *Lucania*, were of very much greater displacement than that of any cruiser laid down for the Royal Navy, and while he recognised the great difficulties that had to be encountered in designing mercantile vessels, he thought everyone who, like Mr. Adamson, had had to do with the building of both classes, would admit that in proportion to the dimensions, and having regard to the displacement, that in designing these warships they had to do more in dimensions in the Navy than was necessary in the Mercantile Marine. The two services were different. The fact he wished to insist upon was, that this criticism of large dimensions for cruisers for the Navy proceeded for the best part from really imperfect information, and those who knew him would bear him out in saying that in the Mercantile Marine there was a tendency towards vessels of larger tonnage just as there was in the Navy. It was a great pleasure to him to come there again after so long an absence and see still further evidence of the excellent work which had been and still was being done by the Naval Construction and Armaments Co. for the Navy. It was a source of enormous strength to the country that establishments of this nature should exist. There was no country in the world to compare with ours in its resources of shipbuilding, whether for war or peace. The industry was one of enormous value, and all who wished well to the country, must hope for success and continued success of such enterprises as that, and he trusted that if the new arrangement they had all read of in the newspapers was carried out, it would only be the commencement of another period of even greater prosperity for this company under its new name than it had been in the past.

Admiral Boys, in rising to propose the next toast, expressed his regret at the absence of Lord Harris, the chairman of the company. Lord Harris had not been with them very long, but his colleagues on the Board fully appreciated his business capacity, his quiet perception and decision. The reason of his absence that day was that he was attending on her Majesty the Queen. They had, in his representative, Lady Harris, a descendant of one of the greatest naval heroes, who gave to the Navy that significant importance which it now held. Lady Harris had been good enough to come there to-day at considerable inconvenience, and, he was afraid, suffering from indisposition, which they hoped would not be made worse by her exertions that day. They had to thank her for having given the *Niobe* a name. They valued and appreciated her services and he had much pleasure in presenting her, on behalf of the Naval Construction and Armaments Co., with a souvenir of the occasion. Admiral Boys then handed to Lady Harris a beautiful diamond anchor-brooch, supplied by Mr. Storey, jeweller, Dalton Road, Barrow, containing 65 brilliant diamonds of the highest quality, which were elegantly mounted to a special design.

Lady Harris, who was received with applause, said: It gives me the greatest pleasure to come here to-day to perform this ceremony of launching the beautiful cruiser *Niobe*, and I am quite sure that all those who have witnessed the ceremony will join me in wishing her every possible success in her voyages and in her future career every possible goodness and happiness. This, to me, as a descendant of one of the greatest admirals, whose victory at Cape St. Vincent 100 years ago we have just been commemorating at my house at Metford, in Staffordshire, is a particularly interesting occasion, and I feel that we shall also wish that success will bring credit upon all those who have been connected with the building of the ship, and that she will bring great honour to the English Navy. I am delighted to have the pleasure of coming here to show how interested I am in the business with which my husband is so intimately connected, and to tell how sorry he was he could not come here to-day because he had to be in attendance on her Majesty the Queen at Windsor. I must say that I hope the tears of *Niobe* will only be the splash of the waves as they come over her bow. I wish the Naval Construction and Armaments Co. all success in the future, and also the town of Barrow.

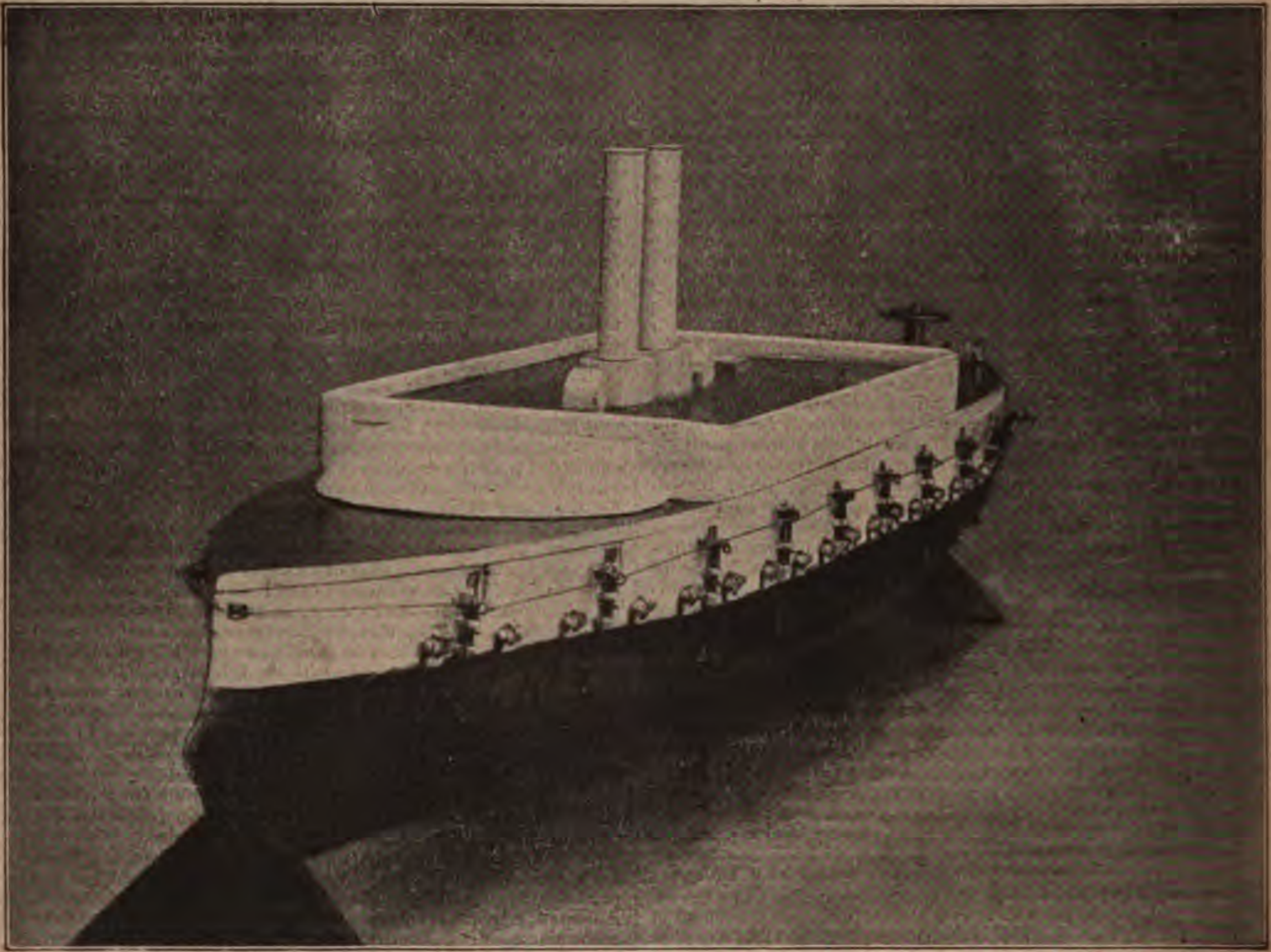
Sir Wm. White, in proposing success to the Naval Construction and Armaments Co., said he would not be doing wrong in saying that the company would wish to be added to the toast, success to their successors when they arrived. With this toast he coupled the names of Mr. Adamson, managing director, their principal host of to-day, and the name of his co-director, Mr. J. Amman-Bryce and he trusted that both these gentlemen might long continue to be connected with the establishment in some way or other.

Mr. Adamson said he had always had pleasure in building ships for the Admiralty. The first time he had to do with the building of these ships he remembered was in 1865, when he had charge of drawings for H.M.S. *Midge*. From that time to this he had always more or less to do in Admiralty work. In the last eight years they had in Barrow one, two, three and sometimes as many as six vessels, building for the Admiralty at one time, and he hoped this would continue, and that there would always be plenty of this class of work.

Mr. J. Annan-Bryce said, on behalf of the directors he fully appreciated the way they had received the toast. Sir William White had been kind enough to say that he hoped Mr. Adamson and himself would be long connected with that establisment. With regard to Mr. Adamson he was glad to say that he would be connected with the company under its new form; but as to himself he was afraid that he as well as the other directors were on the point of performing a happy despatch. He thought there was always a likeness between companies like that and individuals. It was born into the world, struggled for existence, and then finally came the time of its departure, and he could only hope that the company as well as the individual had during the time of its existence done its duty, and would leave behind it a good name. Judged by this criterion the company had not done badly. It had had a short life, and it had been a hard one. It came into existence nine years ago this month, not altogether under very favourable circumstances, because it took over a business which up to that time had not been very profitable. Since that time, however, it had established a name second to none in the country. The yard was known to be the best yard in England or Scotland either. So far as he knew there had hardly been—in fact there had not been—a complaint of any kind of the work they had done. That was owing, he hoped, partly to the co-operation of the Board of Directors, but almost entirely to the ability of the men connected with the management of the yard. First, they had Mr. A. D. Bryce-Douglas, whom they lost in the prime of his life after being with them only a short time. Mr. Adamson, who had succeeded him as managing director, had fully maintained, indeed, increased the reputation of the company. He (Mr. Adamson) had the good fortune to be seconded by many able men, such as Mr. Gowan, Mr. Buchanan, and Mr. McKechnie (who had not been long with them, but who bid fair to be a splendid man), and some time ago Mr. Blechynden. These men had helped to build vessels which were known in all parts of the world, such as the *Oruba* and the three *Empresses*, which bound the British Empire together all round the world. These magnificent vessels, designed by Sir William White, Mr. Durston, and others, would hand down not only their names, but that of the company, to immortality in the annals of England. These were troublous times, and they might see the great vessel they had that day launched take part in war. If she did he was sure she would do credit to her designers and builders. He hoped the success of the company's successors would be equally great. When, a few months ago, a proposal was made by Messrs. Vickers, of Sheffield, the directors thought it the interests of the shareholders that they could not refuse it. The business as it existed up to the present time had been largely speculative, and had rested upon a very narrow basis. Now, however, it would be placed on a broader basis under the control of Yorkshire gentlemen;

gentlemen possessed of means, possessed of intelligence and enterprise. They had made a great reputation as manufacturers of armour-plates and guns, and he had no doubt they would be able to bring into this district an immense increase of business. He thought they would approve of the action of the directors of the company in consenting to efface themselves from the surface of the world. As this would probably be the last function they would have the honour of attending as directors, he begged to thank them for the enthusiastic way in which they had received the toast.

The proceedings then terminated.



Torpedo Guard. Fig. 1.

THE DEFENCELESS NAVIES OF THE WORLD.

THE rapid development and perfecting of various systems of torpedo attack which has been progressing with marvellous strides during the last few years will undoubtedly claim recognition in the next great naval war, as surpassing in destructive capabilities the most effective gun fire or even in eclipsing the dreaded havoc to be anticipated when a battleship is rammed by an opponent.

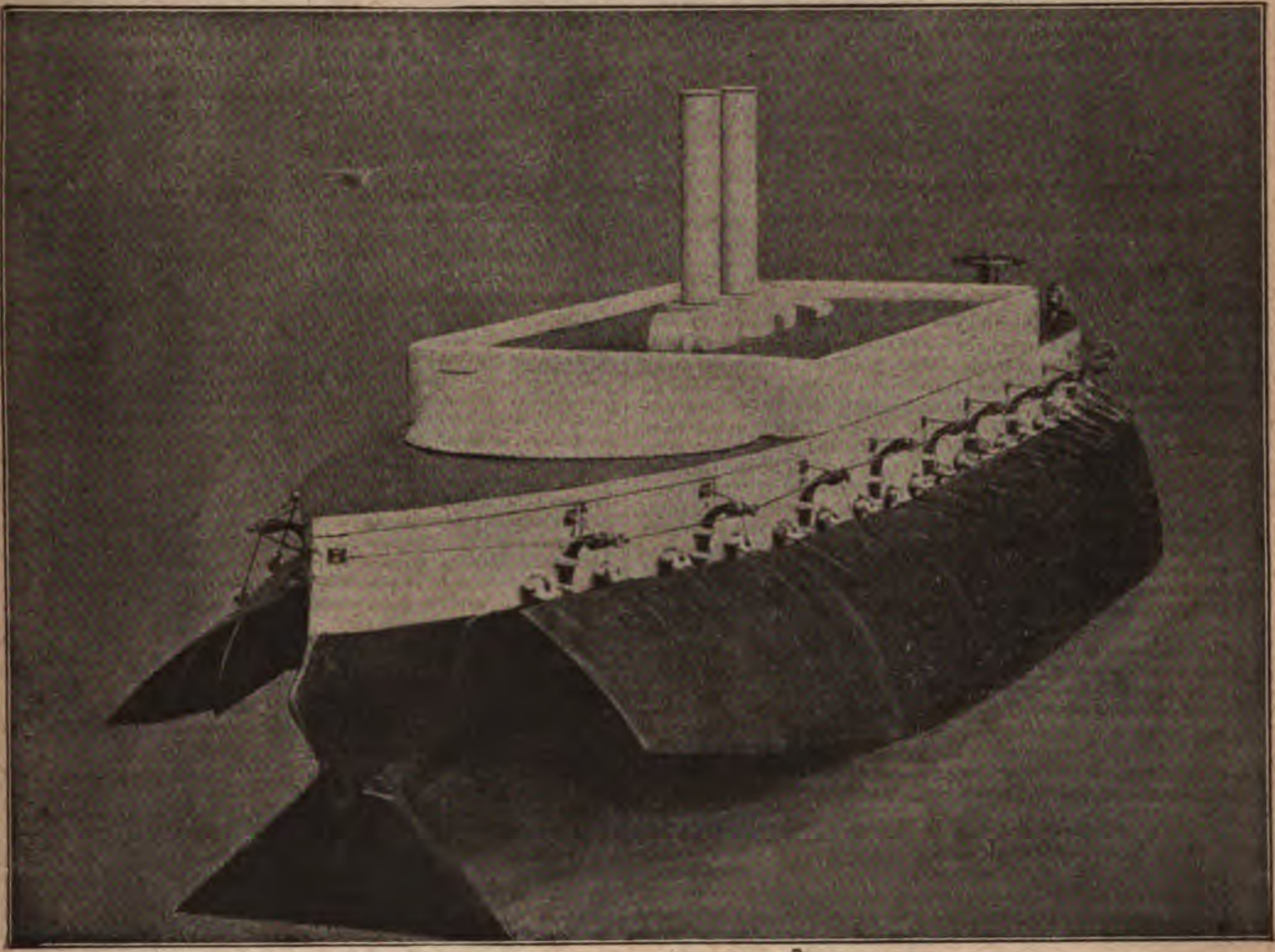
It is claimed that many heavily armoured battleships are absolutely shot-proof in the most vital parts at which the shot and shell of heavy ordnance can be directed. This claim is more or less correct, but when the present vulnerable parts of a ship's hull are considered, forming as they do an expansive under-water target at which torpedoes will be aimed in battle, there is no one to be found bold enough to assert that any battleship in the world is effectively protected against such an attack. Of course most men-of-war are fitted with torpedo nets and booms, but the uselessness of such a flimsy and troublesome apology for defence against torpedo attack is deplored by all naval authorities.

The case of the battleship *Sanspareil* when preparing to resist torpedo attack at Torbay on Saturday, the 25th of July, 1896, during the course of the naval manœuvres, will illustrate one feature of the useless character of this attempt to protect ships against torpedoes. When the order "Out nets" was given the lengths of netting had to be laid along the ship's deck to be shackled together and fastened to the booms. In this ship the task of getting out the nets was hampered by the fact that she could not carry her nets ready hauled up to the booms owing to these nets in that position covering up her battery of 6-in. quick-firing guns. Every available man, stokers off duty, as well as bluejackets, had to lend a hand in this laborious task, and they managed to get these nets rigged out in about a quarter of an hour from the time when the order was first given. Considering that torpedo-boat destroyers now travel at a speed of over 30 knots per hour it is evident that in actual warfare the *Sanspareil* could have been torpedoed and sunk before her nets were placed in their protective position.

But even supposing that this wire netting could be operated more expeditiously than in the case referred to, it has other grave faults. For instance, they materially hamper the firing operations and movements of a ship to which they are attached.

In most ships they would when *topped* mask a number of guns and also the discharge of deck torpedoes. Again, the first evolution of a ship in harbour on sighting an enemy is to get under way, which cannot be done until her net defence, which would be rigged out, is got on board. The insuperable difficulties attending this troublesome operation conveys the opinion that a ship thus caught at anchor is in all probability a ship lost, and that this loss is mainly attributable to the detrimental nature of her so styled "defence."

Even should the ship attacked not attempt to get under way, but remain at anchor with her nets out, trusting to them for defence, her case would be still hopeless. It is well known that every destroyer now possesses cutters which can be attached to any torpedo, and which will cut through the toughest and heaviest nets ever yet made without prematurely exploding the torpedo. The most successful "net cutter" yet invented is that of Rear-Admiral Wilson. Leaving the point of so-called torpedo net-protection of ships at anchor, which is shown to be worthless, its uses at sea are *nil*, as it would be impossible to use them at all on a ship under way.



Torpedo Guard. Fig. 2.

It is evident that if external protection is to be adopted it must be arranged in a very different form to any that at present exists. A system of torpedo defence which is well adapted to fulfil the conditions to be met in submarine warfare is shown in the accompanying illustrations. This torpedo-guard system of defence is the invention of Dr. G. Horatio Jones, F.R.S.L., of Great Russell Mansions, London, W.C.

As will be seen, it consists of a series of steel-plate shields shaped and stiffened to conform to the configuration of the portion of the ship to which they are fitted. In the system here illustrated, which is only one of a number of alternative modes of operating steel-plate guards, the shields are hinged to the ship's side just above the water line.

Fig. 1 illustrates the Jones torpedo defensive shield when stowed, that is, when closed up to the ship's contour ready for sea. These guards, when thus closed, do not offer any undue resistance to high speeds, as the additional thickness they create on the under-water section is no more than that which is put upon our fastest wood-sheathed and coppered cruisers.

Fig. 2 shows this torpedo-guard in its defensive position, to which it can be almost instantaneously extended by automatic means, thus allowing all the hands on the ship to attend the fighting and working of the vessel at a crucial moment when the battleship is engaged in the heat of action at close quarters.

Captain S. Eardley-Wilmot, R.N., late chief torpedo expert of the Admiralty, in his report on torpedo defence, after condemning the net and boom system says:—"This plan proposed by Dr. Jones is, in my opinion, the best which has yet been put forward for guarding against the terrible effects of locomotive torpedo attacks; and, looking to the grave issues involved, I consider that expenditure would be wisely incurred in giving it a thorough trial."

Sir Edward J. Reed, K.C.B., F.R.S. (late Chief Constructor of the Navy) in his report upon Dr. G. H. Jones' improved Torpedo Guard, says:—"I have examined the patent specifications, models, and documents, descriptive of the Torpedo Guard for ships of war, of Dr. G. H. Jones, of Great Russell Street, London, and have come to the conclusion that it is so well conceived and designed for the important object which the inventor has in view as to deserve practical development upon a working scale.

"In view of the enormous experimental and actual outlay in all the Navies of the world upon torpedo defences of mere network, it may be presumed that it is of vital advantage to arrest an approaching torpedo at a distance of several feet from the bottom of the attacked ships. These net defences are assuredly much inferior in many respects to the sheet-steel defence provided by Dr. Jones, especially as regards the relative quickness and efficiency of bringing them into and out of position, operations for which Dr. Jones makes provision by means of most ingenious but perfectly sound mechanical arrangements. Nor must I omit to mention that the torpedo guard of Dr. Jones protects the bilges of the ship, from the keel outwards, in a manner wholly unapproached by the net system, or any other system with which I am acquainted."

We may state, in conclusion, that the inventor, Dr. G. H. Jones, F.R.S.L., of Great Russell Mansions, opposite the British Museum, has, besides the system shown in our illustrations, patented various other modifications of his systems of steel-plate defence.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our own Correspondents at home and abroad.)

Portsmouth Dockyard.

THE chances of a naval review in connection with the Queen's Diamond Jubilee being held at Spithead have been much discussed here, but the general opinion appears to be that no such review will take place, which will undoubtedly be a setback to the hopes of Portsmouth. Several Nelson relics have lately come to light here, chief among which are four handsome candlesticks which were in use in Nelson's cabin at the battle of Trafalgar. On the 1st of May the Admiralty will take over from the War Office the site of the present Anglesea Barracks. Very early in the new financial year it is hoped that a start will be made towards the demolition of the old buildings on the site and the erection of new ones, which will enable the output of work from this yard to be increased. A while ago we received news of a story from Glasgow, to the effect that five battleships of the *Canopus* class, were to be laid down, but it now appears that this was a rumour pure and simple. The Controller of the Navy paid us a visit recently in connection with the proposed new Royal yacht. Many of the designs of the late Prince Consort are to be duplicated in the new yacht, especially in the matter of the internal fittings. The work on the *Cæsar* and *Gladiator* is growing apace, although, owing to several unforeseen obstacles arising for which the yard is not entirely responsible, the former vessel is somewhat behindhand.

Watertube *versus* Cylindrical Boilers.

In the Year Book of the Office of the United States Naval Intelligence, the verdict of Mr. Durston, the Engineer-in-Chief of the British Navy, is given as in favour of water-tube boilers as against Scotch and other boilers, for marine purposes. It is his belief that the advantage of lightness is of great importance in war vessels where high speed for a short distance is required. The low cruising powers which most vessels exert during best part of the time they are in commission is only a small proportion of the power which they are really able to develop, and he thinks that a small engine is more productive of economy in such a case. The use of water-tube boilers of the Belleville type in about twenty-three ships of the British Navy was subjected to much severe criticism in the House last year, when several members gave it as their opinion that they were adopted without sufficient trial, and supposing they had turned out to be failures all these vessels would have had to be supplied with fresh boilers, and the British taxpayer would have had to suffer for the money thus wasted. But the rapidity with which it is possible to get up steam, the Admiralty contended, outweighed all other considerations. On the other hand, Mr. James Howden opined that there would be a difficulty in maintaining steam for a period with the engines at rest with these boilers, owing to the small quantity of water they contain, their larger grate surface, and their small steam room, which renders it necessary to remove fires, lay down steam, and have the fire bars recoaled and ready for lighting. Thus, he argued, ships fitted with the boilers in question are generally unprepared; while, on the other hand, vessels fitted with cylindrical boilers are ready to move at a few minutes' notice. He was backed up by Colonel N. Soliani, who thinks that none but torpedo boats should be fitted with water-tube boilers, but believes that a middle course will eventually be adopted by retaining the best characteristics of the cylindrical boiler, while the exigencies of modern steaming and increased efficiency are to be secured by means of arrangements of water tubes. The trials of the *Powerful* and *Terrible* has demonstrated the soundness of Mr. Durston's judgment.

The Use of Liquid Fuel in Foreign Navies.

The use of liquid fuel in France is said to be gradually on the increase, in fact she is said to be the largest user of this kind of fuel of any country in the world. All her ships are to be fitted for burning this auxiliary fuel, which is very much on the increase in favour for marine boilers. As is perhaps fairly well-known, the petroleum is of the consistency of thin treacle, with very little smell attached to it, and is of a light brown colour. The wear and tear on the boilers is lessened by its use, and the necessity for forced draught and closed fireroom is done away with by the method by which the fuel in injected into the furnaces, which is in the form of spray, the heat being intensified thereby. A M. Siegle has invented a boiler for the sole use of this particular fuel, which is now under consideration by the French Admiralty. He claims for his invention that it brings about complete and direct utilisation of heat and perfect combustion, the smoke pipe gases being free from all traces of carbon monoxide. The heating surface is increased by the single furnace being divided into a number of tubular telescopic furnaces, which also have the advantage of consuming the fuel regularly. Germany and Italy are also going in for the use of liquid fuel on an extensive scale. It is claimed for it that by its use it is possible to increase the speed of a vessel from 8 to 13 knots in from 7 to 15 minutes, without extra expenditure of coal. The larger vessels are to carry about eighty tons of this fuel. It has been contended that if it is possible to obtain so many advantages from the use of this liquid fuel, the sooner it is adopted by our Navy the better, but it is advisable for the Admiralty to act with a certain amount of caution, especially when it is remembered that we do not produce petroleum in this country, while we have plenty of coal.

The Health of the Navy.

The report of the health of the Navy for 1896 has recently been issued, and from it we gather that on the whole this may be regarded as satisfactory, if we take notice of the preface to the report by the Director-General. The increase in the number of diseases is attributed principally to the numerous cases of influenza rather than anything more serious. This increase in diseases among the men occurred chiefly on the Home, China, Cape of Good Hope, and West Coast of Africa Stations. Unfortunately, too, there is an increase in the number of deaths; but this is accounted for by the disaster at Chemulpo, when the pinnace of the *Edgar* foundered and 48 officers and men met their deaths. An increase in malarial fevers is also to be noticed, which occurred mainly among the sailors engaged in the different punitive expeditions on the East and West coasts of Africa, especially in the Brass river expedition. The lowest sick rate was on the South-East coast of America station, and the highest on the East Indies station. The ratio per thousand sick men daily on the Home station was 40·43; Mediterranean station, 37·19; North American and West Indian, 36·52; South-East Coast of America, 33·38; Pacific, 41·12; Cape of Good Hope and West Coast of Africa, 48·85; East Indies, 49·9; China, 45·12; Australian, 44·87, and in the irregular force, 43·06. The particular diseases from which the men suffered appear to be enteric fever, from which 270 patients suffered, and out of these 50 died; cholera is responsible for four deaths, and dysentery eight. There are 10,292 cases of venereal disease, one case to every seven officers and men, and although these figures are startling enough, still they are a slight decrease on those of the previous year.

Chatham Dockyard.

There is an abundance of work here. The sister ships *Arethusa* and *Leander* will before long have been finished, especially the latter ship, which is now practically completed, but with regard to the former it is not expected that she will be afloat for another three months. The *Monarch* has at last left the basin here, and sailed for the Cape of Good Hope to relieve the *Penelope*. Although she is nearly thirty years old, with her present modern armament and new machinery she will prove a very useful adjunct to the vessels now at the Cape. Much satisfaction is expressed that the *Agincourt* should have been commissioned as training ship for boys here. Some 800 boys will now be able to be instructed in gunnery and ordinary ships' work. Now that the new shipbuilding programme has transpired, it is known that no new battleship will be commenced at this yard during the ensuing financial year. It is hoped that the battleship *Goliath*, and the cruiser *Vindictive*, will be almost finished by the end of the present financial year, and although the keel of the *Goliath* was only laid two months ago the progress of the work upon her has been very rapid. The *Dido*, *Diana*, and *Venus* are almost completed, the first-named vessel having received her armament and made her gun trials. The others will take place very shortly. The other two have successfully passed their steam trials.

Dangerous Paints on Board H.M. Ships.

The Board of Trade inquiry into the cause of the explosion on board the *Scotia* has fully justified the authorities in deciding that hereafter men-of-war shall not be allowed to carry dangerous paints. The cause of the explosion seems to be about a hundred-weight and a half of composition, which was stowed away in the forepeak of the vessel in question. In some way or another some of this mixture was spilt, and the petroleum spirit in it evaporating became mixed with the air, and thus a highly explosive compound was formed. The boatswain of the *Scotia* having reason to go down the hatchway of the forepeak, it being dark, took a naked lmap with him, and an explosion immediately resulted. The damage caused was considerable, but luckily no life was lost. It appears that the Board of Trade regulations regarding the storage of these dangerous paints have been extremely lax. It is to be hoped that after this inquiry these rules will be made more stringent, and that the character of the stores carried in all sea-going vessels will be strictly examined, and all paints, compositions, &c., such as was the cause of this explosion, barred from being taken aboard. A witness at the inquiry stated that there was sufficient petroleum spirit in one hundred-weight of the composition in the *Scotia* to make 5,500 cubic feet of air a highly dangerous explosive, and if this is the case, the sooner the new regulations come into force in the Mercantile Marine the better for everyone concerned. The Admiralty, at any rate, have been prompt enough in this matter, and we congratulate those who have been responsible for the rule which prohibits the carrying of all such compositions in confined places on board any of her Majesty's ships.

Activity in French Dockyards.

The French Navy is having considerable trouble with the boilers of several of its vessels. The *Jaurebuiberry* has been in trouble, as has the *Fleurus* at Cherbourg. The boilers of the latter vessel, which are of the French Admiralty type, have turned out to be extremely unsatisfactory. Her boilers were reconstructed, but on their first trial leakages were apparent, and she was compelled to put back to port. This incident has been used as the stick with which to beat the authorities, who have been severely criticised on account of this and other similar cases. A writer in *Le Yacht* deprecates this adverse criticism, asserting that it is unfair, as the boilers which are the main cause of the attack have already been discarded. He further makes a statement to the effect that France is ahead of other nations in the matter of boilers for her warships, but few people will agree with him here. Several other French ships are under repair at the different ports, among which may be mentioned the *Forbin*, of the Reserve Squadron, and the *Bombe* and *Lalande*; while several others will shortly be in port for finishing touches and slight alterations. The battleship *Massena* will shortly begin a series of trials after having undergone some repairs. The second-class cruiser *Suchet* has left for the Levant, where she will relieve the *Bugeaud*. The *Bombe* has had new boilers put into her, and when ready is to replace one of the station boats at Constantinople, and as she has a sea speed of nineteen knots, will be a considerable addition to the strength of the foreign fleets already in the Bosphorus.

The Navy Employment Agency.

This agency, which has now been established a little over six months, lately issued a report pointing out the progress made since its inception. The report showed that a steady increase in the scope of its usefulness had taken place during the past six months, and that it only depends upon the amount of publicity given to it to enable it to make even better progress. The committee express their regret that in spite of the fact that the agency has been generously supported by many distinguished officers and individuals of all ranks, that the practical encouragement which they had looked for from Her Majesty's Navy has been somewhat disappointing. It is to be hoped that the committee will not have to complain of this at the summer general meeting, for such an institution deserves the best support both from officers and men. The rules of procedure as drawn up at first were somewhat too exacting, but these have been modified in order to better suit the exigencies of the service, and it is now proposed to include the Marines within its scope. Commander Kinder, the energetic and able secretary, in his report, states that sixty-two men have been found employment since the agency commenced work, and in only three cases had any fault been found by employers with the men supplied to them, and in these cases steps had been taken to find substitutes for them immediately. The agency, though conducted primarily for the benefit of the men, has, it is satisfactory to note, been instrumental in obtaining employment for an officer with a large family, who, in spite of his good record and certificates, was in a state of absolute destitution at the time the agency came into existence.

The Institution of Naval Architects.

It has been resolved, at a meeting of the Council of the Institution of Naval Architects, that a gold medal shall be presented to any member or associate of the institution, not being a member or associate member of the council, who shall, during the forthcoming spring or summer meetings, read a paper which, in the judgment of the council, shall be deemed to be of exceptional merit. The council has also decided to give a premium of books or instruments to anyone, not being a member of the Institution, who shall read a paper, which, in their judgment, shall be considered to deserve such a distinction. The annual general meeting of the Institution will be held on April 7th in the Hall of the Society of Arts, when the Earl of Hopetoun, G.C.M.G., will occupy the chair. The annual dinner will take place on the same day, in the Grand Hall of the Hotel Cecil, and members who intend to be present at the dinner are requested by the secretary to give him an early intimation of the fact.

Devonport Dockyard.

We have plenty of work on hand at this yard, although the battleships *Renown* and *Hannibal* have now reached the completing stage, and the cruisers *Arrogant*, *Furious*, *Doris* and *Juno*, are making fair way in that direction. The building of a pigeon loft at Mount Wise is also well advanced, the Admiralty, after a deal of persuasion, having been prevailed upon to spend a little over £250 for this purpose. The construction of the *Ocean* has of course been the great topic of conversation here, and although she was only officially dropped into position on February 15th, she was really on the blocks nearly a month ago, and at the date mentioned nearly 250 tons had been built into her. The new slip here is not giving the greatest amount of satisfaction on account of its being uncovered, and if this is to remain unaltered the workmen engaged on her will heartily wish she had never been commenced, if the weather of the last few weeks does not speedily improve.

Laying the Keel of the "Ocean."

Following closely on the laying down of the new battleships *Canopus* and *Goliath* comes the news that the *Ocean* has commenced building. She is one of the battleships to be built under the naval programme authorised by the Government last year, and is the last of the batch to make a start in the public yards. Those who will be in the main responsible for her during construction, saw her keel dropped in Devonport dockyard on the extended and widened slip, from which she will emerge a full-blown battleship, with much satisfaction. There was no ceremonial, and although there is as a rule a goodly gathering of the public to witness such an event, none on this occasion put in an appearance, and if they had, there would have been nothing for them to see, for the whole business was exceedingly matter of fact. The laying down process simply consisted of the rapid swinging by steam winches and hoists of some steel keel plates, these being screwed on ready for the steel sides, which will be rivetted on by electricity. That part of the keel, already prepared was dropped about a couple of inches into position. She is by this time beginning to assume definite shape, but as she is to be 13,000 tons displacement, there is of course a tremenduous amount of work to be done by those in charge of her before she will look anything like a battleship. She is certain to be pushed on as rapidly as possible, and sixteen to eighteen months is expected to elapse before she is finished. The yard is not quite so well equipped with plant as it might be, but with the number of hands largely increased, and new lines of rails, and steam winches, etc., Devonport, in spite of this handicap, should not be far behind the rival yards. This is the first battleship entrusted to the yard, and it will not do to ignore the importance of maintaining its hitherto excellent reputation in the matter of construction owing to a desire to build the vessel in record time. While no stone should be left unturned to prevent delay, no undue haste, and consequent bad workmanship, should be permitted.

Cost of Foreign Warships.

The German press has lately been calling attention to the time required for the construction of German men-of-war and English vessels, pointing out the difference in time required for the building of the *Kaiserin Frederich III.* and the ships of the *Royal Sovereign* class. The *Diadem* is cited as a cruiser of about equal tonnage to the German *Kaiserin III.* and it is pointed out that the former was built with much more celerity than the latter, which is to take nearly four and a half years to build. Considerable discontent is also said to prevail in Russian Naval circles regarding the condition of the Black Sea Fleet. The telegram adds that a Naval commission, under the presidency of Admiral Avelan, is about to inspect the Fleet and also the squadron, which is now at the Piræus. The object of the committee is to find out whether the vessels are ready and in suitable condition to take part in any necessary action which may arise out of the situation at Constantinople. The commission is also said to be carrying sealed orders for the ships in the Piræus, to be acted upon in case of any unforeseen occurrences happening. If things are as bad as some suppose, considerable outlay will be rendered necessary thereby, and some little time elapse before the squadron would be ready.

The United Service Magazine

for the past month contains another article by Mr. C. M. Johnson, late Chief Inspector of Machinery, on the insufficiency of the engine-room staffs on our men-of-war. In it he points out that it is upon the engineers that the captain must rely to carry the ship into battle, and if unhappily he should meet with disaster and have all his weapons disabled or his ammunition exhausted, to bring her out again. He, however, maintains that it is upon the engine-room staff that he must depend to enable him to carry it on successfully, but although this is too self-evident to need any demonstration, the present condition of affairs is that the chief engineer on board ship is handicapped by the want of training in the subordinate branches of his crew, and by the insufficiency of his complement. In 1891 the Committee on the Manning of the Navy, which included engineer officers of the highest rank, proposed a reduction in the number of engineers, and along with this reduction, which came into operation a year later, an increase in the number of artificers and stokers, the higher grades removed being replaced by lower ratings. The change proved most beneficial to the Navy. The writer agrees that the scheme was a judicious one but thinks the reduction of the number of engineer officers has now passed the limit of sound economical policy and advocates that their ranks should be reinforced immediately. "We cannot afford to wait until they are manufactured at Keyham College," says he. "There are hundreds of young engineers in this country in every way qualified to enter the Navy, and the country should insist on getting them, let the price be what it may." The danger which Mr. Johnson so forcibly points out is bound to increase unless more candidates are attracted to Keyham, for the present arrangements, by which only thirty-five students are to enter this year, are certainly none of the best.

The Fire at the Fairfield Shipbuilding Works.

It now appears that the damage caused by the fire at the Fairfield Shipbuilding and Engineering Works at Govan was not quite so great as was at first supposed. First accounts stated that £50,000 was the extent of the loss sustained, but this figure turned out to be exaggerated. The fire was mainly confined to the joiners' shop and tracing loft, which were totally destroyed, and the number of men thrown out of work was close upon fifteen hundred. Temporary sheds were erected in which to accommodate a great many of the men and the greater proportion of these are now at work again. The whole of the building, which covers several acres of ground, seemed to be a mass of flames within ten minutes of the outbreak, which occurred early in the morning, shortly after the men had left their work for breakfast. A good deal of work is at present in hand at the yard, and it is not expected that the fire will be the cause of this getting seriously behindhand although a little time must necessarily elapse before things are once more in full swing. The first-class cruiser *Argonaut*, which is at present building on the stocks at Govan, was for a time said to be in danger, but eventually escaped injury. The place was fully insured but it is not yet known just what the loss to the insurance companies is likely to be.

Pembroke Dockyard.

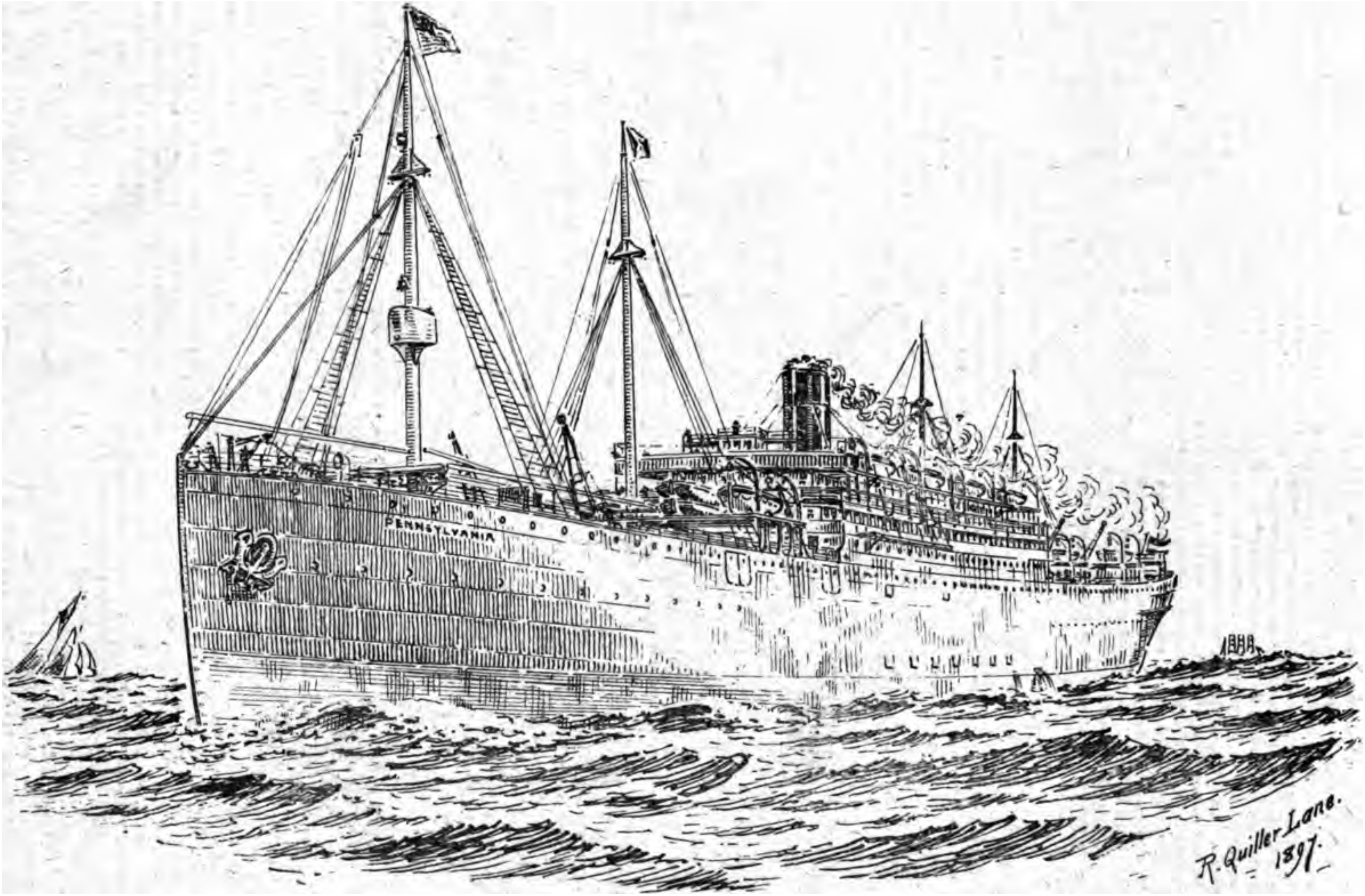
There has been a fair amount of work to get through at this yard. The *Andromeda* has now had her wood sheathing completed although in order to get this done the workmen engaged on her have been working almost time and a half. The operation has taken nearly six months. The *Hannibal* is in an advanced stage of completion, and the work on the *Andromeda* and *Spartiate* is being pushed forward as rapidly as possible. The first-named ship is expected to leave by about October next. Her machinery and boilers are almost completely finished, and an endeavour will be made to bring off the initial steam test within the next few days. She will remain at Hobbs Point until the launch of the *Andromeda* next month, and when the *Thunderer* moves out of the moorings she now occupies will take her place. There has been a little delay in the work of coppering the former ship owing to the non-arrival of sufficient nails, but the delay was not a long one, and the inconvenience fortunately was not great.

Spanish Shipbuilding.

A Spanish publication has just given us a description of the two new gunboats which have just been built for the Spanish Government by the Cavite Yard, in the Island of Luzon. They are, we are informed, for vigilant service on the Lake of Lanao. in Mindanao. Their length is 93 ft. 6 in.; breadth, 24 ft. 6 in.; and mean draught, 3 ft. 8 in., and with engines giving an I.H.P. of 175, and a speed of ten knots. Each of the vessels will carry one small quick-firer. There is one curious point of interest in regard to these gunboats, and this is, that at the amidships section, they are said to be wonderfully like the Greek *trireme* of the time of Pericles, as that ancient craft has been reconstructed by Senor Menleon, of the Naval Museum at Madrid. This gentleman contributes to the same paper which gives these details an exceedingly interesting article on the subject.

Executive Titles for American Naval Engineers.

The agitation raised in America by the engineering staff of the Navy for executive titles has now reached a point which is about as far as it can ever possibly hope to get. A committee of the Congress of the United States has just agreed upon a bill for the reorganisation of the Navy, the early part of which deals with the executive branches, which are to remain unaltered, but the latter part deals with the subject of sea titles for engineers. It is proposed that the Engineer Corps shall consist of 18 captains, 25 commanders, 60 lieutenant commanders, 70 lieutenants, 65 junior lieutenants, 65 ensigns, and a number of naval cadets, to be appointed by the Senate and the President. The bill further provides that all graduates of technological schools of the United States and enlisted men may be eligible for appointments as engineer cadets. The number of the latter to be assigned to the engineer corps are to be 40 over and above the number of vacancies occurring during the year ending May 31st preceding. Details are given for the appointment of graduates of technical schools. An enlisted man, if below the age of 26 years, may be examined for a commission in this corps. The Bureau of Steam Engineering is to be known as the Bureau of Engineering, and the work with which it has to deal is specified. An engineer-in-chief and an assistant engineer-in-chief are provided for, and officers of the Engineer Corps may be detailed as instructors in engineering at the technology schools. A naval station is to be established for engineering experiments, with an engineer officer as director, and the pay of officers of the corps is to be the same as ordinary executive officers. It is pro-


PENNSYLVANIA
R. Quiller Lane. 1897.

The Hamburg-American Steam Packet Co.'s S.S. "Pennsylvania." (*See page* 486.)

vided that engineer officers shall command in their own department subject to the authority of the commanding officer, but shall not be entitled to command in any other departments of a vessel. It is the almost unanimous opinion of American naval officers that the Bill is certain to be shelved, and it is anticipated that this will be the last heard of the agitation for some time to come.

The Report of the National Life-Saving Society.

The annual report of that excellent and deserving institution, the Life-Saving Society, states that the work of the society during the past year has exceeded the most sanguine anticipations, and that its great aims and objects have now become almost universally known. In a great many colleges and schools teaching the pupils how to save life is now considered a subject of primary importance. Splendid work has been accomplished by the New South Wales branch by whom classes have been formed and the aims and objects of the society extended throughout the colony. In New Zealand and Canada the methods advocated are being met with satisfactory results, and in nearly all the towns of England, Ireland and Wales the different organisations have made the question of life-saving a subject for regular and systematic instruction. The committee express their deep gratitude to the London County Council for the help they have afforded the society by permitting them the free use of the various park waters and bathing places under their authority for the purpose of life-saving displays. The whole of the income of the society from year's end to year's end was only £439 odd, and the only wonder is that such a vast amount of good work has been done with such a modest income and that the society is not better patronised. It is certainly a very meritorious institution and one that should meet with general support.

Sheerness Dockyard.

The *Pelorus* and *Proserpine* here are well on the way towards completion, and the *Pomone* is growing apace. The *Pelorus* has still a few jobs to be finished off, and it is to be regretted that she has had to be hurried so much, but the press of work has been heavy here, as of course it has in most of the yards. Her electrical fittings have been satisfactorily tested, and when commissioned it is expected she will join the Channel Squadron. We have been busy refitting here and are likely to be for some time to come. The old coast defence ship *Hotspur* is to be taken in hand, and it is proposed to mount quick-firing guns on her, and this, with several other improvements, will make her a very passable fighting ship, although she is nearly a quarter of a century old. The *Swallow* is also undergoing a refit at a cost of over £11,000, and will be commissioned in about six months time.

French School of Naval War.

A draft approving of the new Superior School of Naval War has at last been passed by the French Naval Committee. Its function is officially defined as that of "spreading among naval officers a common doctrine," and to prepare them for the directive duties which they will be called upon to assume. It appears that the school is to be created to satisfy the craving that exists for a definite scheme or body of teaching upon strategic and tactical matters. The school is neither like that created by M. Lockroy nor that of Admiral Besnard. It is proposed that it shall be at Toulon, and that lieutenants in the first course of their rank shall be admitted by competition. They are to undergo a two years' course, the first of which is to be at the school and the second at sea. The school is to be directed by a flag officer. The officers who manage to pass the course successfully will be selected to join the staffs both afloat and ashore, and one-third of the appointments falling to the ranks to which they belong or may be promoted, will be reserved for them. Admiral Fournier, who was at the head of the school created by M. Lockroy, was heard by the committee and advocated the addition of a division of cruisers to the squadron as a school, and Admiral Roustan, who was also heard, expressed himself in favour of Admiral Besnard's school, which he has the direction of at the present time in Paris, and was supported by Admiral Besnard himself in his opinion.

Erratum.—On page 468 of our last issue, in the report of the Marine Engineers' Examination, instead of 6 successes, it should read—36 from the establishment of Mr. W. H. Thorn, North Shields.

S.S. "PENNSYLVANIA."

WE have pleasure in giving a full-page drawing of the s.s. *Pennsylvania*, exactly as she appeared on leaving Belfast for her first voyage to New York, on January 30th. This huge vessel presented a very impressive appearance while being skilfully navigated down the channel into deeper water, and the builders (Messrs. Harland & Wolff) may well be congratulated on the successful issue of their labours in carrying out their gigantic task. The vessel is lighted throughout with electric light, and has accommodation for upwards of 200 first-class passengers, between 150 and 200 second-class, and some 1,000 to 3,000 steerage, and is replete with every contrivance to make her easy to handle, comfortable for passengers and crew, and secure for goods.

She has been built to the order of the Hamburg-American Steam Packet Co., for their trade between Hamburg and New York, and is of the following dimensions, viz.:—Length, 585 ft.; breadth of beam, 62 ft.; and depth from keel to awning deck, 42 ft. The propelling power consists of a double set of quadruple-expansion (Schlick's patent) engines, with 6,000 I.H.P., giving a high speed. The machinery has been constructed in the builders' works, and is specially designed to avoid all vibration by the adoption of four cylinders and a special arrangement of the cranks, in which the builders have such confidence that they are at present constructing several sets of machinery on the same principle.

She is fitted with seventeen steam winches on deck and a large number of steam cranes, while loading and unloading will be carried on through nine hatchways. Her great height out of the water—her own gangway, seen below end of bridge, did not reach within 20 ft. of it (as seen in our view)—is accounted for by her being what is termed "light." She had only 3,000 tons of coal on board instead of the 20,000 tons weight and measurement which represents the goods carrying capacity of the *Pennsylvania*, exclusive of passengers.

THE FLEETS OF THE MAIL LINES.

(From our own Correspondent.)

MR DAVID KIRKALDY, the well-known engineer of the Southwark Bridge Road, died on the 25th Jan. In later years he had been known as the great authority on tests of strength of materials. This work he performed with a machine which he had himself invented, and his reputation was such as to give the greatest weights to the results he published. Some thirty-five years ago he was in the employ of Messrs. Robert Napier & Sons in their great shipbuilding works on the Clyde. Shortly before he left them they had turned out the very famous Atlantic greyhound *Persia*, for the Cunard Line, and he interested himself greatly in her and her trials. A wonderful coloured drawing of the vessel and her sections was made by him and exhibited at various exhibitions, including those of the Royal Academy. Latterly it hung in his office in Southwark, and that alone would have well repaid a visit to his works.

Another death was that of Captain Andrews, the marine superintendent of the Orient Line. He had held this position since the company commenced its work. Previously to that time he had been in the service of Messrs. Anderson, Anderson & Co., one of the two firms which act as managers of that line.

Breaking up Old Ships.

I have received the usual monthly catalogue of ships, new and old, which Messrs. C. W. Kellock & Co. have to dispose of. The list seems as full and as comprehensive as ever, and the buyer who cannot find his requirements satisfiable in this list must want something very much more of a curio than of the commercial type. Apropos of this firm, it may be remembered that they did not sell the three discarded vessels of the West India Royal Mail fleet. One of these three steamers did not go to the shipbreaker, and she has again changed hands; this time through the great Liverpool firm. She must have been a satisfactory purchase to those who bought her at the original sale for the price Messrs. Kellock got for her was reported as something between 25 and 30 per cent. higher than that originally obtained. A turn-over of a few weeks with such a margin of profit is better than working ships, if it could be relied on, but unfortunately there is no certainty about this market any more than about that which is more immediately concerned with freights.

I was at least premature in stating last month that the three old Holyhead paddlers were sold to the shipbreaker. They are to be spared, at all events for the present, as there is said to be a syndicate formed to run them during the passenger season between Liverpool and the Isle of Man. It will not be forgotten that some years ago the good dividends which the old-established Isle of Man Company pays to its shareholders excited the opposition of another company born for the occasion. This rival organisation ran two of the finest and fastest paddlers ever till that time seen. The competition was keen indeed whilst it lasted, and opportunities for intending passengers were numerous indeed, whilst fares fell to a nominal rate. But in the event the old company swallowed up its younger competitor, and now reckons the *Queen Victoria* and the *Prince of Wales*, its former fast rivals, by no means the best of its large and modern fleet. It has even now a magnificent paddler just ready to take the water at Fairfield, and it should be well able to give an account of a company which relies on boats of a former generation, however great may be their reputation and however well they may have been kept up. Messrs. D. & C. MacIver are said to be the agents of the new venture, and if it be prosecuted to action we may again see stirring times in the Irish Sea.

Paddle *versus* Twin-Screw.

I spoke a moment ago of the fine new boat which the Isle of Man Company is building at Fairfield, and I said she was to be a paddler. The statement, though remarkable, is a fact. The Isle of Man Company tried the twin screw in its hitherto most recent boat, and now in the *Empress Queen* it is reverting to the older, and, as most of us think, antiquated type. What their reasons for the reversion may be I do not pretend to know, but that they are wrong is, I think, obvious. The South Eastern and Chatham and Dover Railway Companies, and the Zeeland Steamship Company are the only important lines beside the Ostend service which maintain their paddle fleets to the Continent. The question of economy does not press any of these very hard. Railway companies do not always work their boats to pay in themselves. They are apt to regard them as expensive feeders to their proper business, that of carrying passengers and goods by land, and they think that a deficit on the boat service does not matter because the steamers bring traffic to the railway. The foreign lines I have mentioned have their subsidies, and so economy does not press them. But they seem hit hardly enough by constant minor accidents.

One seems to be constantly seeing paragraphs that one or other of their vessels have been delayed through a mishap to her machinery, or has lost floats and so been delayed. This is aggravating to passengers and bad for the line. The fact of the matter is that the limit of usefulness for paddles is passed. Up to a certain speed they were well enough, but when that limit was passed the size and weight of the wheels and floats became so enormous that we are constantly hearing of these accidents, and shall continue to do so till the error is brought home to those who are responsible for it, and till the managers change their tactics. Perhaps now that a new Royal yacht is to be built, and that the Queen will be carried by a twin-screw instead of her long cherished but obsolete old favourite, the *Victoria and Albert*, it will be recognised that the day of the paddle is gone for ever.

Disasters.

The early part of the present year has been terribly fruitful in the losses of steamships. No less than three big steamers are at the present moment undoubtedly gone with all hands, though they are not yet officially posted as missing. The well-managed and hitherto fortunate City Line has lost two vessels, one in Indian and the other in Spanish waters, within less than a month. One of these was a comparatively old boat, but she had been modernised by having new engines of the most economical type, and she will, therefore, be a heavy loss to them. Then the Warren Line has lost a big and modern vessel on the Skerries when almost at her journey's end.

The disaster to the *Algoa*, which I mentioned in the February issue as a lesson to owners and builders of big tramps to duplicate their machinery, has been followed by one to another very large and absolutely new cargo steamer. This vessel, on her maiden trip, was disabled by the total collapse of her air pump chamber. She had only one, and so her engines were absolutely useless. The vessels of to-day cannot sail, and so she had to anchor till someone came along who was big enough to help her, and she was towed some seven hundred miles to her destination. All this means expense and delay, besides some risk, and duplication would be an effectual and simple cure for the trouble.

The Daily Press

has made itself even more foolish than usual over the latest White Star development. Someone wired over from Belfast that Messrs. Harland & Wolff had, in the middle of February, laid the keel of a White Star record breaker. He evidently knew something, but anyone could tell that many of his statements were erroneous and even absurd. The White Star people are not often in advance of the requirements of the day. Nor do they wish to take leaps in the dark. One was therefore surprised to learn that the new ship was to have a speed of twenty-seven knots. That would be an increase of five knots over the speed of the big Cunarders, and we may remember that when these ships came out we all thought it a big and unprecedented step to spring from twenty knots in the *Majestic* to twenty-two in the *Lucania*. So the twenty-seven knot part of the business looked suspicious. Besides, even twenty-seven knots would not cross the Atlantic in four days, as the telegrapher said this ship would do. The time would be at least seven hours longer, and when you reduce a passage to under five days every hour becomes considerable. Then there was the statement as to the triple screws. This would have been an entirely new departure for a merchant ship. I should not, of course, have been surprised at any new departure in so progressive a line if I had not remembered that the triple screw principle did not altogether recommend itself by its behaviour in the warships which have adopted it. The action of even the single screw propeller has puzzled the greatest authorities and the triple screw may well do much that is unexpected. It has even been alleged that one of the warships so fitted has gone better with one of her propellers dragging. So there seemed something again suspicious in this statement. But the name given to the vessel was happy. It is well that the name of the pioneer ship of the line should be perpetuated, and perpetuated in the finest ship afloat. The dimensions given were approximately correct. Six hundred and eighty feet. Well, that is nearly seven hundred, and Sir Edward Harland always set his heart on building a seven hundred foot White Star boat. But even that length would not be sufficient for a 27 knotter, though it might be for a 23 knotter. And when all is said and done, a 23 knotter is what we are to expect. Twenty-three knots and 15,000 tons gross. The *Times* went horribly astray, however, in accepting and publishing a telegram which said that even the ship to be expected, let alone the ship described, would cost "nearly £400,000." Why, the *Majestic*, of 10,000 tons, cost over £400,000. The *Lucania*, of 12,500 tons, cost £600,000. A 27 knotter would cost a good million. Yet the *Times* considers itself qualified to write on the question of American mails, and presumes to discuss them when even the first cost of a mail boat is an unknown quantity to it.

A Common Error.

Talking of the *Lucania* reminds me that I was lately shown a book entitled "Our Navy." The general scope of this work brings it outside the view of this column and into that so ably conducted by my naval colleague. Still, I may say that, as far as I saw, the work was one of great care and laborious compilation.

But it was certainly compilation by one without much practical knowledge of ships, for the author fell into the pitfall, which one would have thought had long ago been made plain to everyone who dared to discuss such things, of confounding displacement and registered gross tonnage. Thus he tells of the arrangements whereby a certain number of the finest merchant ships are retained by the Admiralty for use as auxiliary cruisers in time of war. Facts as to this arrangement are easy of access to anyone. For does not the encyclopædic "Whitaker" tell us all about it? And so the writer of the book pens the remark that "the two largest auxiliary cruisers are the Cunard Company's steamers *Lucania* and *Campania*, each of 12,950 tons, but they are still somewhat smaller than the *Powerful* and *Terrible*, of 14,150 tons each." The unhappy man has seen the figures appended to the one pair of sisters in the one part of "Whitaker," and to the other pair in the naval part, and copied them correctly enough, and he has thought that a ton was always a ton. So I suppose it is in this country, at least. But the 12,950 tons of the *Lucania* is an assumed measure of her internal capacity; the 14,150 tons of the *Powerful* is the actual number of tons of water she displaces when carrying all coal, armament and stores. The weight of the hull of the *Lucania* is a trifle which he has forgotten to reckon in making his comparison. In putting these two vessels together he must take the displacement scale, as warships have no register. He will then find that the *Lucania* is some five thousand tons greater than the warship, for she will displace on sailing something very like 19,000 tons. And thus it is that facts are got together for the patient historian.

An Intended Error

of a similar kind is wont to be made by a certain class of shipbrokers. They advertise vessels for passage as of such and such tonnage in round numbers, and say nothing of what sort that tonnage is. Such gentlemen should be regarded with the utmost suspicion. They apparently think that the unwary landsman will book by the vessel of the biggest tonnage brought to his notice. So a correspondent writes to and asks me to tell him what an advertisement which he encloses means. He thinks "the tonnage rather large." He thinks rightly. For on examining the enclosure I find that certain steamers, one of which is described as of "8,000 tons 100 A1," are put forward as sailing to ports east of Suez. These boats are not P. & O. liners, nor do they belong to any great foreign company. The so-called 8,000 ton ship is of, well under 3,500 tons nett register, and her gross will be something about 5,000 tons. Her deadweight capacity is certainly said to be about 8,000 tons. But what is the deadweight capacity of the *Lucania* or the *Majestic*? If one allowed for the greater weight of their engines one might arrive at a figure on this system which would make it not far short of their displacement. The whole thing looks like a catchpenny trick, and I am sure it is one which the owners of these vessels would most certainly refuse to recognise if it were brought to their notice, though I should much doubt if they have the least connection with or control over the person who so describes their ship.

Publications.

From the London agents of the Nippon Yusen Kaisha I have received a very charming little handbook. Its issue marks a period in the history of this great company. We must all have a feeling of sympathy and of admiration for the Japs, who are so much the eastern counterpart of ourselves. The plucky race of islanders which has conquered the inert and unwieldy continental power of China are now determined to make themselves a power in the commercial markets of the world. A formidable power they seem likely to be. They have the instinct of imperialism and of conquest. The people who half a century ago were, not unnaturally considered barbarians in this country, have already learnt much that has puzzled some of the most considerable modern statesmen in the west. They, for example, are talking of adopting a gold standard, whilst some of our authorities still prate of bi-metallism. And they are going to make a bid for the trade of the world. This is not the place to discuss the way in which they are building factories and workshops. Suffice it to regard the entrance of the Nippon Yusen Kaisha into the trade of European waters. The company is not a new one by any means. It was at work upwards of twenty years ago with a small fleet. Then came the Formosa campaign, and a call upon it to assist the Government in transport work. It was equal to the occasion and enlarged its fleet for the effort. When the strain was taken off it did not sell off its surplus vessels, but found them occupation and extended its operations. Then came the great struggle with China. Again it was called upon. Again it was equal to what its country required. A very large amount of new tonnage was acquired. Amongst other vessels I may mention the big twin-screw boat of the Bates line, which had proved the honesty of Queen's Island workmanship on the coast of Spain, and been for a short while under the Anchor flag. Then there were several elderly P. & O. steamers and a few of the Blue Funnel line. All these did good work during the war and most of them are retained to keep up the extended trade of the victorious power. One sign of the forward policy of the company has been the determination to run a line to Europe, and this little book appears as a handbook of information for Europeans in connection with this extension. We are told how the fleet already consists of some sixty-six sail, independent of the dozen fine twin-screw boats now building in British yards for the work of the new service. These vessels, from all that I can hear of them from independent sources, are such as no European line in the Eastern trade can offer to its customers. Of course the Europeans will say, and say rightly, that our subsidy will not allow us to work such ships. That is true enough. But the fact is one of the temptations which beset the European to have been born a Jap. The Japanese Government sees that it is for the good of the country that the best class of fast mail steamers should be encouraged, and they act according to their belief. If we have a Government which ignores the Mercantile Marine, so much the worse for this country. The inter-island services and the facilities offered to the traveller and tourist by the long-established lines of this company seem to be very complete and well devised. The book itself is a possession to be prized. It is obviously made in Japan. If nothing else, the one or two trifling printers' errors which have escaped the reader's eye prove that. But the delicate texture of the paper, the inexpensive but most effective cover, and, I am afraid, the perfection of the illustrations, show that it did not originate in this island of ours. The illustrations and the text also make one long to visit this most interesting country before all its characteristics have been blurred with the cheap colouring of western civilization. One cannot help feeling in sympathy with the Japanese and with their undertakings, though one may be thoroughly convinced that their competition will be, in the future, far more troublesome to us than that of the continental European, though the latter is certainly less palatable to us.

The Pacific Steam Navigation Company

is one of our oldest and, at one time, best managed lines. It seems, however, recently to have fallen on unlucky times. Perhaps the loss of the guiding hand of Mr. James Robinson, the late capable chairman, will explain part of the difficulties. Its latest appearance before the public has been to prosecute one of its officials for alleged misappropriation of a sum amounting to something like two thousand pounds. From all one can see its office system is not quite perfect, and a good system of checks might be usefully devised for it. Then it has had several minor casualties with its ships. Some of these, as for example the narrow escape of its new vessel the *Corcovado*, may be attributed to ill-luck and the ever-present risk of accident to vessels which navigate the huge and imperfectly surveyed coast lines of the South American Continent. Then, of course, it had a good deal to do with the mishap to the *Orotava* in Tilbury Dock. Though that vessel was running on the Orient Line, we see that a good deal of the direction of the ship was retained by her Liverpool owners, for in the inquiry—which has at last been held—the captain mentioned in his evidence that he had gone to Liverpool to make his usual report to his owners at the time the disaster occurred. The result of that most important and necessary inquiry seems to have been to expose some want of proper understanding between the deck and engineer departments in the ship. It is probable that the fault, if there be one, is common to more vessels than one of the fleet, for all the officers must have been educated in the same school, and are subject to the same rules. The company is said to have been very bitter with the Board of Trade for holding the inquiry. But if ever the nature of the case demanded an investigation surely this was the one. Vessels which have for years navigated the seas in safety ought not to sink in dock, and when they do the reason ought to be thoroughly searched out and published. Nor do I know any circumstances in the position of the company, or of those who guide it, which should have afforded them any reasonable ground for presuming that they were to be above the ordinary law of the land, and be exempt from the investigation which any other shipowners would have anticipated. They ought, indeed, to have been pleased to have a judicial assertion that the accident was due to no inherent vice in the ship but to a failure of the human element. That failure, though serious enough in its results, was one which we cannot altogether be surprised at, for a man who is accustomed to cross the stormy seas can hardly be expected to anticipate disaster in the quiet waters of a dock. The fact that such danger exists has now been brought sharply home, and in future there will be no shadow of an excuse for anyone who ignores it.

The Real Facts

about the new White Star flyer are, of course, being carefully kept secret by those immediately concerned. Neither Messrs. Harland & Wolff nor the White Star Line are wont to publish many details of the design and construction of their vessels at so early a stage of their existence. But it is published fact that a flyer really is building at Belfast for the line, and that she will be launched, if all be well, in January, 1898. This is an instance of the great expedition with which shipbuilding operations can now be conducted. For the new *Oceanic* is to be the biggest vessel of any kind, merchantman or warship, afloat. She will not apparently reach the record tonnage of the defunct *Great Eastern*, but she will surpass her and everything else in length. Her sea speed is to be over 23 knots. But that point of detail is conveniently treated with obscurity for the moment. The coal capacity and radius for action of the new vessel are, however, remarkable enough. She is to be capable of steaming round the world at 12 knots without re-coaling.

But there is one point brought out which has perhaps not been sufficiently noticed elsewhere. The Queen's Island yard is now said to have orders for 102,000 tons of shipping for the White Star line. What can all this be? the *Delphic* is 8,000 of it and the *Oceanic* 17,000. I suppose she will have a sister of like size. That will make 42,000 tons in all, but what constitutes the other 60,000? This is no trifling amount: here is an unaccounted-for tonnage which would form a very respectable fleet in itself.

The National Line Report

for the year 1896 is out. The details afforded to the public are very meagre. But we we see that all connection with Liverpool is done with and that all the ships but the *Europe* and *America* are sold. The New York office too is closed and the line is represented on the other side by the agents of Atlantic Transport Company. The directors who retire are replaced by gentlemen connected with that line and a new ship from the Atlantic Transport has been acquired to run in conjunction with the two ships remaining of the original fleet. The only question seems to be, how long will the old concern be able to maintain a separate existence without being merged in its young and active companion?

OBITUARY.

DEATH OF MR. A. BLECHYNDEN.

It is with deep regret we have to record the death of Mr. A. Blechynden, C.E., general manager for Messrs. John Penn & Co., engineers, Greenwich, which took place at his residence, Greenwich, after only a few hours' illness. The deceased gentleman was 47 years of age, quite in the prime of life, and was looked up to as one of the best of marine engineers of the day. Mr. Blechynden obtained introduction to engineering science with Messrs. Hawthorn, Leslie & Co., engineers, on the Tyne, and after leaving their employ he proceeded to Spain, to undertake the general management of the Rio Tinto Mines. He remained in this position for several years, and on coming back to England resumed his connection with Messrs. Hawthorn, Leslie & Co., where he discharged the duties of chief draughtsman with conspicuous ability. At the end of 1886 or the beginning of 1887, he was appointed manager of the engineering works of the Barrow Shipbuilding Co., when the late Mr. W. John had the management of that company's business. On the acquisition of the Barrow yard by the Naval Construction and Armaments Co. he was taken over by the new concern, and fulfilled the duties of his high post with such ability and such success, that he soon made a great name for himself in the engineering world. His was an inventive genius, and his work soon took rank with the highest and the best produced. He remained with the Barrow company until the end of 1895, and built and designed the engines of the three *Empresses*, the three *Latonas*, and those of several other ships of importance, which have been built here. The engines of the *Powerful*, and of the *Juno* and *Doris*, were of Mr. Blechynden's design, and it is no secret that at the Admiralty his work and ability was looked upon with great favour. Indeed, he won his way in a few years to great eminence in the engineering world, and much was expected of him in the future. But his career is unfortunately cut short in the prime of life, and when he had only recently entered on the management of a big engineering concern, in which there was every scope for the exercise of his great genius, and for the employment of his undoubted ability and characteristic energy. In February, 1896, Mr. Blechynden was appointed general manager of Messrs. John Penn & Son's Works, Greenwich, in whose service he has died in active harness. The deceased gentleman took a great interest when living in Barrow in the Naturalists' Field Club, and was the president of that institution for the sessions of 1894-5 and 1895-6. His presidential addresses were marked with ability and thought, and the papers he read to the members on "Art in Photography," "Man's Relations to Nature," and "Moorish Architecture in Spain," were among the most interesting features of the society's proceedings and records. He was a great authority on screw propellers and read two papers on this subject before the North-East Coast Institute of Engineers, and received the gold medal of this corporation for these papers. He devoted himself to different interesting researches, such as the transmission of heat through plates, and he made a special study of bronzes and alloys. Two or three years ago he read a paper before the Mechanical Engineers in Liverpool on "The Last Decade in Marine Engineering," which created much interest and was much commented on. Mr. Blechynden took out many patents of value and of importance, amongst which may be mentioned his water-tube boilers, an oval hole cutting machine, a tachometer for showing the speed of engines, &c. His death is a distinct loss to the engineering world. He leaves a widow and two children (a boy and a girl, to mourn his loss. The funeral took place at the Barrow-in-Furness Cemetery on the 24th inst., and a very large number of mourners followed the last remains of a man of great promise to their final resting-place.

The Commissioned Ships of our Navy.—At the present moment, when the movements of the warships of various Naval Powers in and about the Piræus are being watched with the keenest interest, the disposition of vessels of our Navy now in commission at home and abroad, is deserving of attention. At the time of the commencement of hostilities in the island of Crete the strength of the British Navy reached a grand total of 424 vessels in commission. Of this number 250 ships were stationed in home waters, in the harbours and about the coasts of England, Scotland and Ireland. It must not be understood that all these vessels possess up-to-date fighting qualities, as many of them could not be moved outside the harbours in which they are moored without the probable risk of their becoming total wrecks. These are the last of the old line-of-battle ships, such as the *Victory*, *St. Vincent*, *Duke of Wellington*, *Asia*, *Excellent*, &c., at Portsmouth and similar types of the old wooden walls of the British Navy of days gone by, now moored in other ports. In addition to this non-fighting obsolete type of line-of-battle ships, a still further number of commissioned craft are composed of tugs, tenders, depôt ships, training ships, yachts, &c., &c., so that the actual fighting number of vessels in home waters would form only a fractional portion of the full number given. Second in point of numbers, but far and away the first in fighting qualities, is the Mediterranean Squadron numbering 34 vessels all told. Third in point of numbers we have the fleet in Chinese waters to the number of 24, then in successive order we have on the Cape station and coast of Africa 20, Australia 19, Channel Squadron 14, Particular Service Squadron 11, North America and West Indies 10, surveying vessels 9, Pacific station 6, in harbour at Malta 6, South East coast of America 5, East Indies 4, Hong Kong 4, Gibraltar 3, Kingston, Jamaica 2, Bermuda 2 and on passage home 1.

NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from January 27th, to February 23rd, 1897:—

Barker, Henry C. D., assistant engineer (for temporary service) to the *Immortalite*, to date February 1st.

Bartwell, Charles W. P. S., engineer to the *Royal Arthur*, to date February 11th.

Bennett, James M. C., fleet engineer to the *Royal Arthur*, to date February 11th.

Bolt, Charles W., engineer to the *Rattler*, undated.

Byrne, Albert D., assistant engineer (temporary) to the *Blenheim*, to date February 15th.

Church, Philip D., (probationary) assistant engineer to the *Daphne*, to date February 1st.

Clegg, H. J., assistant engineer, has been promoted to the rank of engineer in her Majesty's fleet.

Cook, Lewis J., assistant engineer (probationary) to the *Royal Oak*.

Crowley, E. A. E., engineer, has been promoted to the rank of chief engineer in Her Majesty's fleet.

Curtis, Frederick T. W., chief engineer to the *Barracouta*, when paid off.

Duke, David E., assistant engineer (for temporary service) to the *Pique*, to date January 26th.

Feak, W. M., fleet engineer, has been placed on the Retired List of his rank.

Fraser, George J., fleet engineer to the *Collingwood*, undated.

Gedye, Henry A., engineer to the *Phœnix*, to date February 11th.

Guyer, T. S., engineer to the *Victory*, additional for the *Starfish*, undated.

Gyles, David J., fleet engineer to the *Dreadnought*, undated.

Hambly, William J., assistant engineer (for temporary service) to the *Rainbow*, to date January 26th.

Hill, Walter S., assistant engineer to the *Sans Pareil*.

Jackson, T. P., engineer to the *Victory*, additional for the *Hunter*, undated.

Jordan, Charles F., engineer to the *Victor Emanuel* or *Tamar*, to date February 1st.

Littlewood, Alfred W., engineer to the *Algerine*, to date February 11th.

Maltby, P. D., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Maudling, W. J., fleet engineer to the *Royal Oak*, undated.

Mitchell, Walter F., engineer to the *Collingwood*.

Mountifield, James, engineer to the *Melpomene*, to date February 15th.

Pearce, W. W., engineer to the *Opossum*, to date February 19th.

Pill, Joseph H., chief engineer to the *Minerva*, to date February 11th.

Read, Alfred T. P., engineer to the *Victor Emanuel* or *Tamar*, to date February 1st.

Roberts, Ivor E. S., assistant engineer to the *Collingwood*.

Skinner, William H., fleet engineer to the *Audacious*, to date February 10th.

Spence, Robert, assistant engineer to the *Royal Oak*.

Summerford, H. G., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Sydenham, Frederick W., assistant engineer to the *Cambridge*, to date February 1st.

Taylor, Carl H. E., assistant engineer (for temporary service) to the *Resolution*, to date February 1st.

Taylor, G. R., chief engineer to the *Cambrian*, to date February 19th.

Thomsett, F. D., engineer to the *Alarm*, to date February 19th.

Venning, Thomas A., assistant engineer (temporary) to the *Undaunted*, to date February 4th.

Vibert, John E., engineer to the *Royal Oak*.

Walton, John S., staff engineer to the *Calliope*, to date February 23rd.

Whayman, William M., engineer to the *Linnet*, to date February 1st.

Whittingham, William, chief engineer to the *Raleigh*, to date February 18th.

Williams, H., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Wilson, J. D., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

HOAR & BROWN'S HARDWOOD MARKET REPORT, FEBRUARY 23rd, 1897.

Teak.—The landed stocks have somewhat accumulated during the last month, and deliveries have been lighter in comparison with the average of last year. The reason may be arrived at by the large sales of floating cargoes which have taken place since the new year, leaving landed stocks inactive. Bangkok timber has been taking a prominent place, being slightly cheaper, and yielding a better average size than Moulmein or Rangoon. The large stock now stored in the West India Dock Co.'s teak sheds consists of all qualities, and can be brought as low as £10 10s. per load.

The good average parcels giving 26 ft. by 38 cube are fetching from £12 10s. to £13 per load.

Floating Moulmein and Rangoon cargoes of 500 loads and upwards have lately been sold at £12 5s. cif., but it is questionable whether more can be had under £12 10s., and it is expected that prices will further stiffen on account of the supplies being very short at port of shipment. Large timber is particularly dear and scarce, shippers of special selections for delivery in three months are asking a price which will only enable buyers to land the wood at about £14 10s. per load.

These prices appear high at present, but the market will soon be ready to take further quantities at the advanced figures directly the supplies now here are reduced. The plank trade has been exceedingly busy. Stocks have become lighter than has been known for years, prices have riser rapidly and will still go higher, the mill owners are declining to make quotations for enquiries placed before them, and altogether the cut stuff appears to be difficult to obtain in any large quantities.

Mahogany.—Although the supplies are fairly considerable prices are hardening, and the late sales have commanded full prices, and eager purchasers are found bidding beyond their limits to ensure stock.

Honduras.—Good logs are much in demand, and 24 in. and upwards are fetching extremely high figures, the minimum qualities remain quiet. This applies also to Tobasco.

Cuba and Spanish.—The importations are light, stocks are small and prices are high, the larger sizes are scarce and very dear.

African.—This wood rules the market for cheapness, the importations are fairly large, and the quality of the timber has improved.

Panama and Tecolutla.—The market is almost bare. Good Panama would be welcome, and realise good figures.

Cedar, Honduras, Tobasco, and Cuba.—The small stocks have caused prices to run so high that business becomes difficult, and consumers are turning their attention to substitutes, such as round African mahogany, Paraguay, and Sequoia.

Kauri Pine.—Supplies are moderate, prices keep firm, and the demand keeps steady. Shippers are asking a slight increase in values for forward contracts.

Sequoia.—Some "without reserve" sales are taking place, and figures were reduced to 1s. 10d. per foot cube.

Walnut Logs.—Stocks are fairly heavy, and medium to lower qualities are not doing so well in comparison to the higher grades. Large sizes have greatly increased in value. Lumber of first quality and good thicknesses is making a market, but there is not much call for inferior consignments.

Whitewood.—The recent landings have been offered at lower rates, and the values are now at their lowest. Consumers should take the opportunity of purchasing while the market is depressed.

Greenheart.—Very little business comes to London. The stocks are small, and shippers' valuations are increasing for further supplies.

Padouk.—A gradual decrease in the stock and a gradual decline in the demand is perceptible. No further cargoes have lately come to hand, and any increase in the stock is undesirable.

Business may be described as "fairly good," but the New Year's turnover has fallen off slightly.

Vestra.—The new steamer *Vestra* recently built by Messrs. Ramage & Ferguson, Limited, Leith, for Messrs. J. T. Salvesen & Co., Grangemouth, left on February 17th on her maiden voyage. The speed obtained on her trial trip was over 11 knots.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(From our own Correspondent.)

ORDERS for new tonnage were very scarce during the first part of February, business being distinctly dull, although there were several inquiries abroad for passenger steamers of a good class, but shipowners seemed determined not to place new tonnage until spring movements set in. The latter part of the month has seen a decided change, several good contracts being placed and it is reported that several large steamship lines are negotiating for important additions to their fleets. During the month 19 vessels, totalling 16,500 tons, have been launched. The fresh work booked comes to 23,000 tons, as compared with 28,000 for the corresponding month last year. It is to be hoped that the "spurt" in trade will not be impaired by disputes. Unfortunately labour troubles are not yet settled, the point at issue being whether the machines in shipbuilding establishments are to be worked exclusively by members of the Amalgamated Society of Engineers; unless a settlement of this difficult point is effected, it is feared another deplorable strike is well-nigh inevitable.

The Carlisle conference, which was adjourned for a fortnight and was to take place the beginning of February, has not yet been held. The question of extra remuneration for services on trial trips has, by a kind of general understanding, been left in abeyance for a time, shipbuilders being left to make their own terms.

At a meeting of Dundee engineers held on the 24th ult., it was unanimously agreed to request an advance of 3s. per week on the rate of wages paid.

A settlement has been effected between the shipbuilders and the ship carpenters and joiners. The men demanded an advance of ½d. per hour; the employers offered as a compromise ¼d. per hour, to continue for six months from April 1st. The matter was submitted to a ballot, and the result is that the offer has been accepted by 1,098 to 483 votes.

On February 6th the Watt anniversary lecture was delivered in the Watt Institute, under the auspices of the Greenock Philosophical Society, the lecturer being Mr. W. H. Preece, C.B., F.R.S., Engineer-in-Chief of the Post Office, London, who had as his subject "Watt and the Measurement of Power," in the course of which he said:—

James Watt, who died 77 years ago, was a great inventor He was "one of the most illustrious followers of science, and one of the greatest benefactors of the world." If he had never improved the "fire-engine" of his, the "steam-engine" of our day, the copying press alone would have maintained his name on the scroll of inventive fame. His greatest invention—that which has been most prolific in exciting further improvements in the steam-engine, and which has supplied the engineer with a new sense—is perhaps the "indicator." The indicator enables an engine itself to record automatically on paper a diagram which, properly interpreted at leisure, conveys a clear history of the performance of the steam in the cylinder. It enables the engineer to measure the actual work that is being done by it, and it gives a report of the action of the valves and parts which control the ingress and egress of that steam, and which regulate the performance of the machine. It gives an insight into the internal actions of the machine, which, being out of the range of direct observation, are so liable to be misinterpreted. It is to the engineer what the stethoscope and the thermometer are to the physician. Accuracy in measurement is the foundation of engineering and the secret of practical success. It leads to the detection of error and to perfection in working No instrument has been more productive of improvement in this respect than Watt's indicator, and few instruments have been found to require less modification. The conception and development of this apparatus showed that Watt was a long way before his time in grasping the doctrine of energy and applying the practice of graphics.

He went on to say how the principle of work lies at the very root of the profession of the engineer; Watt gave us not only the means to measure, but a system to indicate it. He gave the origin of "horse-power," and the electricians' measurement, the same principle which enabled Watt to examine the interior of his cylinder enables the electrician to examine and record the behaviour of his plant and his circuits. Mr. Purvis, president of the society, occupied the chair, and there was a good attendance.

The sixth annual dinner of the Glasgow Association of students of the Institution of Civil Engineers was held in the Windsor Hotel on February 1st. Mr. John Wolfe Barry, president of the Institution, occupied the chair, and the company numbered upwards of eighty. After the customary toasts had been duly honoured, Mr. Gentles proposed "The Institution of Civil Engineers." He remarked that it was of advantage to some institutions to be purely local, but it was of the essence of the Institution of Civil Engineers that it was world-wide. It was something more than a merely educative institution, it fostered a spirit of *esprit de corps* and developed a brotherhood in the profession which existed in all parts of the world, showing that theirs was a profession in deed and not in word. The Chairman, in responding to the toast, mentioned that the Institution now numbered upwards of 7,000 associates, members, and students. He thought that that was very remarkable progress to make in the short time which had elapsed since the idea of having such an institution first took root in 1817. He referred to the examination which was about to be instituted for the admission of associates of the institution, and remarked that although it might occur to some that it was a rather hard departure to make, it would be for the good of the Institution as a whole.

The toast of the evening was given by Mr. J. M. Gale, who referred to the benefits to be derived from such associations.

Mr. R. A. Erskine Murray, in replying, said that the ambition of the Glasgow association was to rival the London association in enthusiasm if not in numbers.

The fourth general meeting of the 40th session of the Institution of Engineers and Shipbuilders in Scotland was held at 207, Bath Street, Glasgow, on January 26th. The discussion of Mr. Sinclair Couper's paper on "Internal Corrosion of Boilers" was concluded, and Mr. M. Paul read a paper on "Suction Draught." The discussion on this was continued, and in intimating the adjournment the chairman, Professor Jamieson said that at the next meeting Mr. Andrew S. Biggart would read a paper on some details in new methods of structural steel work.

On February 4th a disastrous fire took place at the Clyde Shipbuilding yard of the Fairfield Shipbuilding and Engineering Co., resulting in the destruction of one of the most important portions of the premises. A large number of men were thrown out of employment, but the company is erecting temporary sheds, and most of the men have started work again. The total area destroyed was estimated at 400 ft. by 200 ft.

Messrs. D. & W. Henderson, Meadowside, Partick, have secured an order to build for an Italian nobleman, the Duke de Abbruzzi, from designs by Mr. G. L. Watson, a new cutter of about 80 ft. linear rating, and it is expected to be launched early in May.

Messrs. James & George Thomson, Limited, Clydebank have contracted to build for the Brighton, Worthing, and South Coast Co. a paddle steamer, almost similar in type and speed to the *Jupiter*, recently built by the same firm for the South-Western Railway Co.

Messrs. Ramage & Ferguson, Limited, Leith, have received an order from Messrs. Geo. Gibson & Co., Leith, to build a fast steamer for their Continental trade.

Messrs. W. Rodger & Co, shipbuilders, Port-Glasgow, have contracted to build two steel screw steamers, each of about 240 ft. keel, for Messrs. Robert M'Andrew & Co., London. These steamers are to be employed in the Spanish trade.

Messrs. The Caledon Shipbuilding and Engineering Co., Limited, of Dundee and London, have lately received a further order from the Cork Steam Shipping Co., Limited, of Cork, to build for them a vessel 239 ft. by 32 ft. by 15 ft. 8 in., fitted with engines of about 1,000 H.P., the steamer to have cranes and winches for the quick handling of general cargo. This will be the eighth steamer built by the Caledon Co. for the Cork Steam Shipping Co., Limited. They are also building an oil-tank steamer for service on the Caspian Sea. Her dimensions are:—Length, 217 ft.; breadth, 32 ft.; depth, 15 ft. 6 in.; and her boilers will be adapted for burning oil fuel.

Messrs. Fleming & Ferguson, Limited, shipbuilders and engineers, Paisley, have received an order from the Queensland Government to build a stern-wheel steamer for passenger traffic in connection with the Government railways; and for the Chilian Government an order for a tug steamer.

Messrs. John Scott & Co., shipbuilders and engineers, of

Kinghorn, have contracted to build for foreign service, a large steel screw steamer for passenger and cargo trade. This vessel and her machinery will be built to the requirements and under the special survey of the British Corporation Registry, to take its classification.

Messrs. Carmichael, M'Lean & Co., Greenock, have secured a contract from Messrs. J. & J. Denholm, Greenock, for a steel screw steamer of 1,050 tons deadweight.

Messrs. Chambers Brothers, Greenock, have contracted to build for Messrs. Blohm & Voss, shipbuilders, Hamburg, six collapsible boats, these being in addition to eight already in hand.

The new steamer *Vestra*, recently built by Messrs. Ramage and Ferguson, Limited, Leith, for Messrs. J. T. Salvesen & Co., Grangemouth, left on February 17th, on her maiden voyage. The speed obtained on her trial trip was over 11 knots.

TRADE NOTES FROM THE TYNE, WEAR, TEES, HARTLEPOOLS, &c.

(*From our own Correspondent.*)

THE TYNE.

Shipbuilding.—At the time of writing, labour complications are causing a vast amount of trouble and inconvenience throughout the whole area of the North-east coast, and the principals of shipbuilding firms have something else to do besides seeking orders to succeed the vessels on the stocks. It would seem indeed, that their time is pretty fully occupied in attending meetings to interchange views among themselves upon the situation, or mixed conferences of shipbuilders and workmen's representatives, to haggle over the claims of the latter. Scarcely a day passes but there is a meeting of one kind or another, and though no complaints are heard of from the shipbuilders, it is certain that this constant haggling over wages adjustments has become a great nuisance to them. Were there properly constituted arbitration and conciliation boards in existence for the whole of the trades connected with shipbuilding, these inroads upon the time of principals would be enormously lessened, and many important advantages would be secured in other directions. The time when all labour disputes shall be settled by boards of the kind referred to, cannot be long delayed. The more complete organization of the workmen that has taken place within the past few years, has made the need of such institutions more urgent, and has at the same time smoothed the way for their creation. The evils of the present system, too, have become so flagrant, that the common sense of the country will soon insist on the application of the obvious remedy.

The chief of the troubles which at present exist is the claim of the "unskilled" or "lesser skilled" workers for an advance of wages, which claim has resulted in a partial strike, extending over a large part of the Tyne district, and in which over 2,000 men are directly involved. The labourers demanded 10 per cent. advance, and were offered 5 per cent. This offer was voted upon and rejected; but it turned out subsequently that the offer had been wrongly interpreted. This, however, was only discovered on the very day on which the men had been directed to cease work, and too late to prevent the partial strike, which has, unfortunately, taken place. Through some unaccountable blundering, the platers' helpers at Elswick, Low Walker, and Wallsend are on strike, while those at Jarrow, Hebburn, and Shields are at work. At the moment it is impossible to see how this will end; but one result is very probable, namely, a disruption of the union.

The shipbuilders have also a trouble with a section of the smiths, who are connected with the Amalgamated Society of Engineers. These men have been on strike in the Tees district for some time past, though other sections of smiths, having come to an amicable arrangement on the wages question, are at work. Notice has now been sent to the Amalgamated Engineers' representative, that unless the men he acts for return to work by February the 24th, the services of the Amalgamated Society smiths on the Tyne and Wear will be dispensed with.

The shipwrights have also a claim for an advance of wages before the employers, and several other sections of men have made demands which have been partly acceded to or are still under consideration. Very shortly, too, another trouble of the greatest gravity will arise, that is to say, when the three months are expired, during which the caulkers at Armstrong & Co.'s Low Walker yard consented to work to the demarcation award *re* caulkers and drillers.

Taking all things into consideration, the shipbuilders have a bad time before them, and it will take a lot of careful piloting to steer safely through the rocks and shoals around them and ahead.

Though workmen of all grades are clamouring for more wages, in the belief that employers are overrun with work, and are going to double their fortunes, the real facts are that enquiries for new tonnage have again become scarce, and prices of material as well as labour having risen, the possibility of profit has become very problematical. The shipbuilding boom was strong while it lasted, but it is plainly evident that its force is spent, and it is certain that shipbuilders who still receive offers of work cannot get the prices that were obtainable three months ago. Old steamers are again beginning to be laid up—which circumstance is undoubtedly ominous—and there are already some forty or fifty of these survivals of a byegone age moored on the lower reaches of the Tyne. Some are probably for sale, and it is to be hoped that our enterprising neighbours of Norway and Germany may soon absorb them in their shipping lists. If England is to retain her supremacy on the sea, her ships—whether for mercantile or fighting purposes—must be the best, and there need be no regret, therefore, at seeing the slow and ill-equipped types of other days passing into the hands of foreigners.

Messrs. Armstrong & Co.'s yard at Elswick is full of work, and great inconvenience is experienced through the existing strike of platers' helpers, which causes a number of other workmen to be laid idle. At the company's Low Walker Yard work is also plentiful, and the keel for another large cruiser—there being three already on the stocks—is now being placed in position.

It is understood that Messrs. Wigham Richardson & Co. have received an order for a Japanese steamer of much larger size than those they have recently completed for owners in that country. The vessel will be fitted for passenger service as well as for cargo, and will have machinery capable of propelling her at a high rate of speed. The firm have other vessels in hand for foreign owners, one of which, now in frame, is of exceptionally large dimensions.

Messrs. C. S. Swan & Hunter have commenced the construction of a large pontoon dock in an adjoining yard, which has been unoccupied for some years, and which will now be permanently held by the firm for the building of pontoons only. This will practically form a third yard belonging to Messrs. Swan & Hunter, for they already have two yards in operation, each of which constitutes in itself a fully equipped shipbuilding establishment. The building berths in these two yards—commonly known as the East and West yards—number no less than eight, which are suitable for the building of the very largest vessels. The two largest of the berths are covered in by specially constructed sheds, so that vessels up to 500 or 600 ft. in length can be built in them without being touched by wet, from the laying of the keel to the launching, and without any necessity arising for interruption of the work through bad weather. We believ this is the only private shipbuilding establishment in the world which possesses such an advantage, and there is little reason to doubt that owners who desire the highest degree of excellence in work, combined with punctuality of delivery, will in a little tim become cognizant of the fact. The work of restoring and refitting the s.s. *Aorange*, which was undertaken by the firm last year, is now nearly completed, and the vessel will proceed to Londo early in March. The *Aorange* is a vessel of the very larges class, which was built by one of the leading firms on the Clyde and was purchased in the early part of 1896, from the New Zealand Steam Shipping Co., by Messrs. Huddart Parker & Co of Melbourne. It is to form one of the Canadian-Australia Mail Line, which was brought into existence some few years ago through the enterprise of the last-named firm. The interio fittings of the vessel have been entirely renewed, and accommodation for 100 first-class and 50 second-class passengers h been provided. The new fittings are the very best obtainable, and the general equipment of the vessel leave nothing to be desired. The arrangements for vent lating and lighting by electricity are most elaborate, and th manner in which passengers' comfort has been catered for ma be judged by the fact that in addition to sleeping and dinin rooms, there have been provided for their use bath-rooms, smoke-rooms, music-rooms, and promenades. There is also an isolated chamber for the storage of fresh provisions, so that passengers can live, even when in the tropics. on pretty much the same sort of diet as they are habituated to when at home. The engines, which are of 5,000 H.P., have been supplied by the Wallsend Slipway and Engineering Co., Limited, and will propel the vessel at a speed of 16 knots.

Messrs. Hawthorn, Leslie & Co. are reported to have booked an order for four other steamers, similar in size and equipment to the steamers *Cornwall* and *Devon*, built by the firm for the Federal Steam Navigation Co., Limited.

The firm have a large number of workmen employed on the Russian volunteer steamer *Orel*, which was referred to in this column last month, and judging by the amount of "cutting out" work already performed, it is clear that this repair contract is one of more than ordinary importance.

The vessel occupies the firm's large graving dock, where she will doubtless remain for a good many weeks to come. In the new work department the firm have five vessels on the stocks and one on the river fitting out.

Messrs. Robert Stephenson & Co. are busily preparing for the construction of the pontoon dock ordered by the Spanish Government, and which will be the largest yet constructed.

The Palmer Co. have, in addition to the war vessels that are in hand, several mercantile ships, one or two of which are much beyond the ordinary in the matter of size. The Tyne Shipbuilding Co. have three large boats on the stocks, while Messrs. Readhead and Messrs. Edwards have all their building berths filled.

Engineering.—The opening of the Newcastle-on-Tyne Electrical and Engineering Exhibition of 1897 took place on the 15th inst., the opening ceremony being performed by the Mayor in the presence of a representative assembly of the principal residents of the city and environs. The building has been considerably enlarged beyond the original scope, and every available foot of ground—excepting what is required for refreshment, promenading, and entertaining purposes—is occupied with exhibits of a most interesting description. The opening function was a great success, which augurs well for the success of the enterprise as a whole.

The marine engine works keep very busy, and a scarcity of skilled labour is still being experienced. At the Elswick Ordnance works heavy orders have been placed, and full activity is assured for the whole of the present year. Mr. R. Y. McIntosh, agent for Kirkaldy's "Compactum" Evaporators, and other specialities for steamship equipment, has removed from No. 27, Quayside, to more commodious premises at No. 57, Dean Street.

Electric Lighting.—Messrs. J. H. Holmes & Co., electric engineers, Newcastle, achieved a record last year as regards the amount of work turned out, the number of dynamos and motors in various sizes supplied to customers being no less than 250, which considerably exceeds the output of any previous year. In respect to motors, it may be stated that the firm have recently acquired the "Lundell" patents for this country and the colonies, and are now making a large addition to their works with a view to being able to cope with the great demand for this description of plant. The "Lundell" motor, it may be stated, possesses many very special advantages; one important feature is, that it is entirely enclosed in a cast-iron casing which effectually protects the armature and magnet windings from injury. The design of the motor is such that this cast-iron shield forms a part of the magnetic circuit, and the metal is used to the best advantage in every way, thus ensuring a minimum weight, in proportion to the power evolved. Owing to its peculiarity of design, it also lends itself very readily to such combinations as "coupling up," or "gearing with" other machinery. These motors may be seen at work at the firm's stand in the Electrical and Engineering Exhibition, which has just been opened, and those interested in such work should not miss the opportunity presented of seeing the motors in operation. In the matter of general installation work, the firm keep very busy, and have in hand the electric lighting and electric ventilating of several large vessels, among which is one in which the engine and boiler casings are kept cool by a special method of ventilation to ensure the comfort of passengers. The firm have just carried out a number of electric transmission of power installations, and have in hand several other contracts in this particular line, of which they are making a speciality. The lighting of the Middlesbro' railway station and docks, for the North-Eastern Railway Co., is expected to be completed about the end of March, and will form the largest and most important electric lighting installation in the district. It may be added that the generating station in this case will be larger and more complete than many stations for town lighting now in existence.

THE WEAR.

Shipbuilding.—It has transpired that besides the two twin-screw steamers that have been ordered from Sir James Laing & Sons, by a Japanese syndicate, another high class steamer of large size, but having only one set of engines, has been ordered from the firm by a different company of Japanese owners. This firm have just launched a handsomely designed mail and passenger steamer for Swedish owners, and have on the stocks several large vessels of special types. Messrs. Robert Thompson & Sons are at present very busy, having on the stocks three large vessels in various stages of construction. At Messrs. Short Brothers' yard, the use of electricity as a motive power has been further extended, and practically all the machinery is now driven by electrical power. The firm maintain a night shift in the frame-turning department, and are exceedingly busy throughout.

Messrs. Doxford have their five berths occupied with three large "turret" ships and two torpedo destroyers for the home Government. The construction of the latter is being actively pushed forward and it is expected that they will be ready for delivery well within the time specified by contract.

Messrs. John Priestman & Co. are fairly well off for work and are likely to be kept busy during the greater part of the year. It is understood that the "self-trimmer" steamer *Unique*, which was launched by this firm in September last, has given great satisfaction to her owners, not only as regards the possession of good sea-going qualities, but in other respects of equal importance. The vessel appears to have achieved a distinct success, and we shall not be surprised to hear of orders for boats of this type being placed in the course of the next few months.

Messrs. J. L. Thompson & Sons have in course of construction a Japanese steamer of large size and high-class type, similar to one which is being built at the yard of Sir James Laing & Sons. The yard is at present very busy and all the frame furnaces are in operation. The two yards at the South Dock are fairly busy, which remark also applies to Messrs. Blumer's establishment.

Engineering—The North Eastern Engineering Co., South Dock, have added to their already large premises a new pattern-makers' shop, in immediate connection with the foundry. This will not only facilitate work, but will also, it is understood, bring about satisfactory results in the direction of economy. Last year the company made an addition to their boiler department and also improved the machinery equipment in some of the shops, thus showing that they are determined to maintain and develop the efficiency of their works, to keep pace with modern requirements.

At the works of the Sunderland Forge and Engineering Co., Limited, an incident has recently occurred which caused a good deal of inconvenience to the management, and tends to illustrate one of the worst aspects of trade unionism. It appears that a man who was not a member of the Amalgamated Engineers' Society was put to work at a certain boring machine, which could on occassion, by an adjustment of valves, be utilised as a lathe. The engineers raised an objection against the man, contending that only a "skilled mechanic," or, in other words, one of their own number, should be permitted to work the machine. The employers, to their honour be it said, stood by the man whom they had appointed to work the machine, and refused to remove him at the engineers' request. The latter have consequently come out on strike, and it seems highly probable that the incident may lead to a general lock-out of engineers on the North-east coast. It will be seen that the principle involved is a most important one, for it practically amounts to the proposition that the Society of Amalgamated Engineers shall direct and carry on the works instead of the company who built them, who equipped them, and who own them. The company have a very interesting stand at the Newcastle Electrical Exhibition, to which we hope to refer more fully in next month's issue. Foundries, forges, and ironworks, as also the smaller engine works, are without exception, well employed.

The Hartlepools.—Messrs. Furness, Withy & Co. are said to have booked an order for two cattle steamers, the machinery for which will also be constructed at the Hartlepools. At the Central Marine Works a set of engines is being constructed for a passenger vessel building at Sunderland, the speed of which is to reach 17 knots. Messrs. Richardson have, among other orders, the machinery to supply for a large Japanese passenger boat, which is being built at one of the local yards.

Stockton.—Work is plentiful at this centre, the yard of Messrs. Ropner & Sons being particularly busy. Messrs. Blair & Co. have an abundance of orders, and night shift is maintained in most of the departments. Rolling mills are exceedingly busy in the manufacture of shipbuilding and boilermaking materials, and both bridge and boiler works are kept actively enployed. Labour disputes, however, are causing considerable trouble, a number of the smiths being on strike, and a good deal of unrest being apparent among other sections.

Middlesbro.'—In the shipyards and engine works business is still active, and steel and iron works are kept fully going on orders booked some time ago. New business does not appear to come to hand in sufficient quantity to fully replace completed orders; and it is probable that in a few weeks from now the pressure of work will be greatly lessened.

Darlington.—The activity which has existed for some time past in the Forge Co.'s works, remains unimpaired, and, as new orders have been booked, a prosperous state of business is assured for the next twelve months.

THE MERSEY.

(From our own Correspondent.)

THE activity recently reported in the marine and genera engineering trades of this district shows no material falling off. Shipbuilders and marine engineers are all kept well engaged, whilst in the general engineering industries, although in some quarters a diminution in the weight of orders coming forward is reported, that is mostly due to special and temporary causes, which do not affect the general position of trade. Most branches of engineering continue actively engaged, and the outlook for the future is of a very encouraging character. Wages questions in some of the machine making trades have during the month been settled, but disputes on other matters are still pending.

The usual monthly returns issued by the principal engineering trade unions continue of a very favourable character. The Amalgamated Society of Engineers has now only a little over 2 per cent. of its total membership on unemployed benefit, which represents a substantial reduction upon last month's returns, whilst the percentage in this immediate district is about the same as for the society generally. The membership also shows a steady increase, the number being now 87,500, whilst during the month advances in wages have been secured in several important centres, both in Lancashire and elsewhere, and the eight hours' day has been adopted in the ship-repairing shops in the port of London. The Steam Engine Makers' Society has now only ½ per cent. on donation, which is the smallest proportion of unemployed that has been recorded since 1890. The reports as to trade indicate that activity is generally being fully maintained, and marine centres especially continue exceptionally busy.

The seventy-second annual report of the Steam Engine Makers' Society, which has this month been sent out to the members, shows the position of the organization, both financially and numerically, to be more favourable than it has ever been at any pervious period of the society's existence. The balance at the commencement of 1896 was £30,478, and the income during the year has been £21,407. The net expenditure was £14,155, thus leaving a balance of £37,729, or about £4 12s. 11½d. per member. The membership is now 8,118, and there are 105 branches, of which 101 are in England, and one each in New York, Montreal, and Brisbane respectively. The net result of the year's working was an increase of four branches, 1,033 members, and £7,251 in the capital value of the society—a result not arrived at during any previous year of the society's history. The income was £2,389 in excess of 1895, and £3,832 above 1894, this being chiefly due to an increase of £2,108 in contributions, and £262 in entrance fees. The expenditure was only £14,155, as against £17,366 in 1889. In 1895 £6,009 was paid to unemployed members, but in 1896 only £2,985 was disbursed, or about 7s. 4¼d. per member. Sick benefit was £3,590, and funerals £1,032, which compared very favourably with the years preceding. Working expenses had cost £2,295, or an average of 5s. 7¾d. per member, which was the lowest average expenditure on this account that the society had experienced. During the year four new branches had been opened, viz., Gainsborough, Rugby, Leicester, and Grantham. For the past five years there had been a gradual increase in the number of candidates admitted to the society, the progress made being shown by the following figures. The number admitted in 1891 was 416; in 1892, 451; in 1893, 514; in 1894, 566; in 1895, 685; in 1896, 1,249. The amount paid for superannuation was £3,325, or an increase of £126 over 1895, and the balance sheet of this fund now stood at £13,523, being £1,874 more than in the previous year.

Messrs. Laird Bros., of Birkenhead, are making good progress with the work they have in hand. During the month the first of the Irish mail boats—the *Ulster*—has been tried, and the next two are about ready. The trial-trip of the *Ulster* was a very successful one, and the passage from Holyhead to Kingstown was accomplished in 2 hours 26 minutes, the mean speed being 23·4 knots per hour. The wheel revolutions were 158 per minute, and at times reached 162. The engines worked splendidly, and the trip throughout was a most brilliant success, whilst the construction and equipment of the boat excited general admiration. It may be added that the battleship *Mars* has left for Portsmouth, and the 30-knot destroyer, *Sparrow-Hawk*, has been delivered, at Devonport.

The Frictionless Engine Packing Co., Limited, Cable Mills Oldham Road, Manchester, who have long been in the front rank of engine packing manufacturers with their Karmal packing, have now put on the market a metallic packing (Ogden's patent), to work in conjunction with their other speciality, and to meet the extreme high pressures of steam which prevail at the present time. In this packing the company claim to have combined the best points of metallic and fibrous packings. The new packing is most simple in construction, and can be as easily applied as ordinary fibrous packing, one advantage being that there is no need of alteration in the standard design of the stuffing-box. The packing consists of a bush made of a special lubricating metal, divided into three segments, the joints being cut tangentially, so that the wear is taken up automatically. This bush does not fill up the stuffing-box to the full depth, but is kept in its place by Karmal packing, which fills up the remainder of the box, thus doing away with elaborate arangements of springs, which are constantly getting out of order. We had an opportunity of inspecting this packing at work on a pair of engines by Messrs. Goodfellow, of Hyde, at a large public electrical installation. The engines were running 185 revolutions per minute, with a 2 ft. stroke, boiler pressure 160 lbs. The rods were as bright as silver, and there was no escaping steam, which was striking evidence of the efficiency of the packing. This packing is successfully working in marine and locomotive engines, and ammonia pumps, and the makers have received numerous testimonials from steam users who have given it a trial.

Another old-established manufacturing engineering concern, the Castlefield Ironworks, is now being removed to an outside district, with the object of economising, both in the matter of rent and rates, and the cost of labour. These works were established in 1814, and have been carried on by Messrs. Crighton & Sons, makers of various classes of textile machinery. The whole of the existing plant has been disposed of by auction, and some exceptionally good prices were realised, including, £1,400 for all the patterns; £250 for a planing machine, to plane 20 ft. long by 5 ft. 9 in., made by Kershaw; £85 for a double spindle roller-turning lathe; £76 for a double-geared 14-in. centre cutting and ending machine; £48 for a horizontal milling machine, and £40 for a wheel cutting machine, whilst fair prices were obtained for loose plant, stock, &c.

At a meeting of the Manchester Association of Civil Engineering Students, held during the past month, Mr. C. S. Allott presiding, a paper on the reconstruction of Latchford lock gates was read by Mr. R. H. Garvie, B.Sc. The author opened with a general description of the gates and the cause of the accident, and then dealt with the raising and removal of the damaged gates from the locks, hauling ashore, and the repairs and reconstruction of the gates. The removal of the gates back to the lock, and their re-erection, were then described, the paper concluding with a general account of the methods employed in the removal of the upper gates from the locks to the gate shed. Messrs. W. H. Hunter, Lawrence, and Godfrey took part in the discussion, and the proceedings terminated with the usual vote of thanks.

During the past month the iron trade has shown a decided weakening tendency. Business has fallen off considerably, and as regards prices makers have had to give way in their quoted rates, and they show more anxiety to sell, whilst merchants are underquoting to secure orders. Lancashire pig-iron shows an appreciable change, makers still holding to 48s. 6d. less 2½ for foundry, delivered Manchester. For district foundry brands makers now quote about 46s. net cash for Lincolnshire, and 49s. to 50s. for Derbyshire, delivered Manchester. Forge qualities average about 44s. 6d. net for Lincolnshire, and 45s. 6d., less 2½ for Lancashire, delivered Warrington. Consumers have however, been able to obtain Lincolnshire at 1s. under makers' quotations. In outside brands good-named foundry Middlesbrough now does not average above 49s. 4d. to 49s. 10d., and open brands are offering at about 48s. 4d. to 48s. 6d. net, delivered by rail Manchester. Scotch iron is readily obtained at 50s. 3d. to 50s. 6d. for Eglington and Glengarnock, delivered Manchester Docks, although makers' prices are nominally considerably higher than the above quotations. Several thousands of tons of American pig-iron have arrived during the month at the Ship Canal, and other cargoes are on the way, whilst a representative of a number of furnaces in the States has recently been personally interviewing local merchants with a view of opening up business. Prices for American iron are about as last given, 47s. 6d. net, delivered Manchester Docks, representing the average figures.

In the finished iron trade also the position is scarcely so strong as of late. For Lancashire bars £6 is still the minimum quotation, but there is more disposition to book moderately forward at this figure, whilst, through merchants, they have been quoted for delivery over the year at 2s. 6d. under the above price. For North Staffordshire bar makers still quote £6 5s., but in these also there is underselling on the part of merchants. Sheets remain at about £7 7s. 6d. to £7 10s., and hoops £6 10s. for random to £6 15s. for special cut lengths, delivered Manchester district, and 2s. 6d. less for shipment.

The only change to notice in the steel trade is as regards hematites, which have receded somewhat from their recent strong position, and are now obtainable at about 60s. to 61s., less 2½ delivered Manchester. Billets are still kept down by American competition, and do not average more than £4 14s. net, delivered Warrington. Bars are steady at £6 5s., boiler plates show no appreciable improvement, Scotch makes being offered at £4 7s. 6d. to £6 10s., with local qualities quoted £6 12s. 6d. to £6 15s., delivered in this district.

The metal market continues brisk, and prices show a hardening tendency. An advance in list rates is momentarily expected, but at the time of writing these remain as under:—Solid-drawn brass boiler tubes, 7¼d.; solid-drawn brass surface condenser tubes, 8¾d.; solid-drawn copper tubes, 8¾d.; brazed copper gas, and steam tubes, 8½d.; brazed brass gas tube, 8d.; brass wire, 6½d.; copper wire, 7½d.; rolled brass, 6¼d.; sheet brass, 7¼d. per lb., delivered in this district.

Business in the timber trade has been fairly active, and deliveries satisfactory. Prices generally are firm, and stocks are not excessive. Increased briskness has been shown in contracting for the coming season's requirements, and if supplies are kept within reasonable limits prospects are fair for a steady market. East India teak is in brisk demand, with stocks only moderate, and an upward tendency in prices. Greenheart also meets with a good demand of enquiry, and full prices are being got on business put through.

The coal trade during the past month has not maintained the activity recently reported, and prices have shown a tendency to ease down. House coals have been in fair demand, but the business doing has been only small for the season of the year, and although list rates are unchanged, the full quotations are scarcely being got on the best descriptions. Steam and forge coals meet with a good demand, but supplies are more plentiful, owing to the lessened domestic requirements for lower class round coals, and prices are rather easier. Supplies of engine fuel are also in excess of the demand, especially in the common sorts, and very low prices are being quoted to effect clearances. At the pitmouth best Wigan Arley does not average above 10s. to 10s. 6d.; Pemberton four-foot and seconds Arley 8s. 6d. to 9s., and common house coals 7s. to 7s. 6d.; with steam and forge coals 6s. to 6s. 6d.; and engine fuel, from 2s. 9d. and 3s. 3d. for common slack, to 3s. 9d. and 4s. 3d. for medium sorts, and 4s. 6d. to 4s. 9d. for best qualities.

The shipping trade is fairly good, but increased quantities of steam coal are offering, with the result that prices have given way about 3d. to 6d. per ton, common steam coal being obtainable at about 7s. 6d. to 7s. 9d., although 8s. to 8s. 3d. is still quoted for better qualities, delivered Mersey ports.

NORTH-WEST OF ENGLAND.

(From our own Correspondent.)

Barrow.—The shipbuilding trade of this district has been steadily maintained during the month, but there has not been much new business done. Prospects, however, are very good, and it is certain that at a very early date some really good orders will be entered on the books of the local companies. New work is certainly needed, as the yard of the Naval Construction and Armaments Co. testifies. Now that the *Niobe* has been launched, as reported in another page of this month's Marine Engineer, there is evidently plenty of room for new ships to be laid down. At present the only ships in progress of construction in this yard are the first-class cruiser *Amphitrite*, the torpedo-boat destroyer *Leopard*, the two fast Great Western Channel service steamers *Reindeer* and *Roebuck*, and the sludge boat for the Corporation of Manchester. On the engineering side of the yard, however, the company is busy with the *Niobe*, the Barrow and Belfast steamer *Duchess of Devonshire*, and the three torpedo-boat destroyers *Avon*, *Bittern*, and *Otter*. The *Avon* is ready for her full-speed trials, and the other two will soon be able to take their preliminary trials. The *Duchess of Devonshire* will be ready for delivery in April or in May. She will prove one of the finest and smartest craft engaged in the Channel service, and when she goes on her station will probably be the fastest steamer running between England and Ireland, and with one exception the fastest in the Isle of Man service, that exception being a new steamer not yet launched on the Clyde. But as the Barrow Co. have given their new steamer one knot more speed than the last steamer built by the London & North Western and Lancashire & Yorkshire Railway Co.'s for their Belfast and Fleetwood service, it was but to be expected they would give the retort courteous and go one better still. Indeed it is stated that the new Fleetwood steamer, the order for which has been placed with the Barrow Co., as was to be expected after the great success achieved by the s.s. *Duke of Lancaster*, is to steam 19½ knots under forced draught. The Great Western boats building at Barrow are to have a speed of 20 knots. The days of fast steaming are now with us, and it is interesting to know that with the modern type of engine these high speeds can be secured by means of economical coal consumption. The *Niobe* is well forward in regard to her fittings, and was launched at a weight approaching 7,000 tons. Her engines are completed and ready for "dropping" into the vessel, and nearly all her 36 Belleville boilers have been completed and tested. She will therefore be well on towards actual completion and delivery by the end of the year. In the meantime the question arises as to the character of the new orders likely to come to Barrow to find employment for the Naval Construction and Armaments Co. as the contracts in hand are gradually worked out. Messrs. Vickers & Co., the new owners of the great Barrow yard, have made no secret of their intention in regard to the future. It is proposed to build, and fully equip with their own make of guns and armour-plates, ships of war of all sorts, and that some of these ships will soon be laid down is evident from the activity observable in certain quarters. The shareholders of Vickers & Co. have already approved of the purchase of the Barrow yard, and it now remains for the shareholders of the Naval Construction and Armaments Co. to do likewise. Nothing but legal formula blocks the way, and it may be expected that in the course of a month arrangements will be fully completed. The purchase price to be paid by Messrs. Vickers for the Barrow yard is £430,000. Hopes are naturally very high in Barrow, as it is felt that the acquisition of the Barrow yard by Messrs. Vickers, Son & Co. will lead to a great development of trade, and bring to Barrow a largely augmented programme of work. Apart from any speculative business which may be undertaken by Messrs. Vickers it is certain the fact that this firm can already supply themselves with much of the material required by shipbuilders and engineers at first cost will enable them from economic reasons to stand well in the open market for any new orders given out for either mercantile or Admiralty tonnage, and their position in this regard will gradually be improved as day by day new departments are created in order to make the concern and its capacity as complete and as intact within itself as possible. Although Messrs. Vickers' arrangement is to acquire the works from June 30th last year, paying interest at 5 per cent. to the shareholders of the Naval Construction and Armaments Co. up to June 30th next, they are not yet in a position to assume the control of business, and as a consequence the moribund directors of the Naval Construction and Armaments Co. are still directing affairs. So soon as the transition period is at an end it is confidently expected that Barrow will gradually assume the character of a much more active centre of the shipbuilding and engineering trade than it has possessed hitherto, and it is certain that the many natural and material advantages which Barrow possesses will be utilised to the full, and to the great advantage alike of the new owners of the Naval Construction and Armaments Co.'s undertaking and the town and district of Barrow and Furness.

New Isle of Man Service.—The announcement that Mr. McIver, of Liverpool, has purchased at break-up price the steamers *Ulster*, *Munster*, and *Leinster*, owned by the City of Dublin Steampacket Co., whose places on the Dublin and Holyhead service are being taken by new fast steamers built at Liverpool, and that these three boats are being overhauled with a view of opening out a new line of steamers between Liverpool and Douglas during the summer season, has created much interest in this district. Several attempts have been made to break down the monopoly enjoyed by the Isle of Man Steamship Packet Co. for years, but up to now unsuccessfully. It is unreasonable to expect in these days of keen competition in every department of life and trade that the old Manx Co. would be allowed permanently to farm so large and so lucrative a business. The steamers now owned by Mr. McIver are fairly smart craft, although not up to the *Prince of Wales*, *Queen Victoria*, and the new *Empress Queen* as to speed, are at any rate fairly quick, and can be cheaply worked. Coupled with this the capital account will stand at a low figure, so that a moderate revenue will yield a big profit. On the other hand, the old Manx company are handicapped with a heavy capital and several old types of boats which have seen much service, and certainly are not up to date. One effect of the innovation certainly will be cheap fares, and with cheap fares the hundreds of thousands of people who visit the Isle of Man every season will be increased, and this will justify the increased efforts being put forth to develop one of the most charming and delightful of places frequented by an every increasing number of pleasure-seekers in the North of England who find health and amusement in Mona.

Shipbuilding Material.—There is a good demand for all classes of shipbuilding material, and local makers are very busy in every department. The plate mills are very well off for orders, and both heavy and light plates are in brisk demand. The trade in heavy plates is especially active, and the mills are not only working night and day, but makers have orders in hand which will maintain activity for a considerable time to come, and there is in the meantime a growing demand for all classes of plates and other material from local as well as from other sources. Steel castings for engineers and shipbuilders are in good demand, and this department of trade will be maintained for a considerable time even on the orders already in hand.

Hematite.—There is much life and vigour in the hematite pig-iron trade, and business has been done on a large scale during the month. Makers are very busy, and have orders in hand which will keep them busy for six months to come, but they have only 36 furnaces in blast and cannot increase their production because of the scarcity of native iron ores, not that these ores are actually scarce, but because they are in small output by reason of the fact that no spirited efforts have been made in late years to prospect for new "finds." Mixed Bessemer numbers are quoted at 51s. to 52s. by makers, and warrant iron is at 49s. net cash sellers. Stocks are fairly steady standing now at 297,299 tons, or an increase of 1,353 tons since the beginning of the year.

West Cumberland.—The shipbuilding trade of West Cumberland and district is very busy, and a fairly heavy tonnage is being built. Prospects of a continuance of steady trade are good and the outlook generally may be regarded as distinctly bright and satisfactory.

Shipping.—Shipping is fairly well employed. The total exports for the year up to now of pig-iron have been 49,452 tons, and of steel, 66,072 tons, as compared with 48,073 tons of pig-iron and 66,072 tons of steel in the corresponding period of last year, an increase of 1,397 tons of pig-iron, and an increase of 6,389 tons of steel. Freights are fairly well maintained.

BELFAST TRADE NOTES.

(*From our own Correspondent.*)

THE same busy state of trade still prevails at this shipbuilding and engineering centre as has been the case for some months past. Both firms are booked well forward, and slips becoming vacant by the launching of vessels are filled up again with commendable alacrity.

The most recent launch has been that of the large steel twin-screw steamer *Rotterdam*, which entered her native element on the 18th inst. This large vessel, whose gross tonnage reaches nearly 8,200 tons, has been built to the order of the Holland-American Line to run between Rotterdam and New York, and besides being a large cargo carrier, will have superior accommodation for a considerable number of passengers. The steamer will be fitted with a refrigerating chamber, and every facility provided for the rapid loading and discharging of cargo. Captain Bonjer, Mr. De Meester, and Mr. Van Helden represented the owners at the launch.

Passing from launches to trial trips, there are two of these to mention, the first being that of the leviathan twin-screw *Pennsylvania*, for the Hamburg-American Line. This vessel, after taking on board the (for her) insignificant quantity of 3,000 tons of coal in Belfast, proceeded direct for New York. The other two steamers for this line, viz., the *Arabia* and *Arcadia*, are being pushed on rapidly.

The second vessel to leave the port was the t.s.s. *Gascon*, for the Union Steamship Co., which left her moorings on Saturday, the 13th ult., and proceeded down Belfast Lough for trial trip and adjustment of compasses. The *Gascon*, like the *Gaika*, is on the same lines as the four G.'s already built by this firm, but is considerably larger, being over 6,000 tons register. The leading dimensions are given as:—Length, 430 ft.; breadth, 52 ft.; and depth, 33 ft. The accommodation provided is most complete for first, second, and third class passengers. Electric light and refrigerating apparatus, with cold chamber for the storage of fruit, and also all the latest and improved machinery for working cargo, have been provided, the vessel also being arranged so as to provide a large carrying capacity on a light draught of water. The saloon is finished in oak and teak, and the ladies' rooms in dark mahogany with marqueterie panels, satinwood, and other wood. The smoke-room is done in oak, second saloon in mahogany and satinwood, and the library is handsomely fitted up with bookcase and writing-desk and surmounted by a handsome dome with richly decorated glass. Captain Walter Martin is in command of this fine vessel.

In addition to these two steamers mentioned above, Messrs. Harland & Wolff have in hand another vessel, named the *Briton*, for the above company. This vessel is larger again than the other two, and when completed will be the largest steamer in the South African trade.

The *Kamakura Maru*, built by Messrs. Workman, Clark & Co. to the order of the Nippon Yusen Kaisha, of Japan, will be towed about the end of the month across to Glasgow to receive her engines. The boilers are already in the ship, but, owing to the fire, the engines had to be given out to Messrs. Barclay, Curle & Co., Glasgow, who will also fit them on board.

Good progress is now being made with the *Augusta Victoria*, which is being lengthened in the Alexandra Dock.

The keel of the new White Star *Greyhound* is now laid, and some idea may be formed of the size of the ship when it is known that the scantling of the bar keel is no less than 18½ in. deep and 4 in. thick. The vessel is expected to break the existing Atlantic records, and will be named the *Oceanic*, after the pioneer vessel of the fleet.

Business Announcement.—Messrs. David Joy, Son and Pryor, Consulting Engineers and naval architects, 85, Gracechurch Street, London, E.C., have been appointed the London representatives of Messrs. J. P. Hall & Co., electrical engineers, of Oldham.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Killarney.—On January 18th a steel steam ketch, of about 140 tons gross named the *Killarney*, was launched at North Shields for Mr. James Meadows, of London.

Magnolia.—On January 20th an iron steam ketch of about 180 tons gross, named the *Magnolia*, was launched at Beverley for the North-Eastern Steam Fishing Co., of London.

Lord Nelson.—On January 21st an iron steam ketch of about 162 tons gross, named the *Lord Nelson*, was launched at Hull for the National Steam Fishing Co., of London.

Victor.—On January 21st an iron steam ketch of about 180 tons gross named the *Victor*, was launched at Beverley for the Atlas Steam Fishing Co., of London.

Duchess of Devonshire.—On January 22nd the Naval Construction and Armaments Co., Limited, of Barrow, launched the twin-screw steamer *Duchess of Devonshire*, built to the order of Messrs, James Little & Co., for their line of steamers between Barrow and Belfast, and Barrow and the Isle of Man. The vessel has accommodation for 120 first-class passengers. The moulded dimensions are 300 ft. by 35 ft. by 15 ft.; gross tonnage 1,300. The mean draught is 10 ft. 6 in., and the displacement 1,770 tons. The engines are of the triple-expansion type, indicating collectively 5,000 H.P., while running at 175 revolutions per minute. The high-pressure cylinder is 21 in. in diameter, the intermediate cylinder 32 in. in diameter, and the low-pressure cylinder 50 in. in diameter, each having a stroke of 30 in. The cylinders are separate castings, bolted together, supported amidship on cast-iron columns, and at the sides of the ship by wrought-steel columns, which are bolted to strong cast-iron bedplates. Steam is supplied by two double-ended boilers 14 ft. 6 in. diameter. and 20 ft. 3 in. long, constructed to Board of Trade requirements for a working pressure of 200 lbs. per square inch. The double bottom of the ship forming the engine seat is carefully designed with a view to reduce vibration to a minimum. The body of the condensers are formed of wrought-steel plates, and the total cooling surface of the tubes is 5,400 square feet. The propellers are of the built form, the boss being of cast steel and the blades of bronze. The speed is to be 19 knots.

Sleuthound.—On January 23rd Messrs. Willoughby Brothers launched, at Plymouth, a steam tug which they have constructed for Mr. G. F. Treleaven. The vessel is built of steel, with wood fittings of teak, and is 80 ft. over all; 15 ft. in breadth: and 8 ft. 6 in. in depth. She is fitted with compound surface-condensing engines, the diameter of the cylinders being 13 in. and 26 in. respectively, with an 18-in. stroke. The boiler is 9 ft. 6 in. in diameter, and 8 ft. 6 in. long, and the working pressure is to be 120 lbs. to the square inch. She was named the *Sleuthound*.

Petrel.—On February 1st an iron ketch-rigged paddle steam tug of 145 gross tonnage, named the *Petrel*, was launched at South Shields for the North British Steam Packet Co., Glasgow.

Oriel.—On February 2nd there was launched from the Jarrow yard of Palmers Shipbuilding and Iron Co., Limited, a finely modelled steel screw steamer, built to the order of Messrs. Gracie, Beazley & Co., Liverpool. Her dimensions are as follows:—Length, between perpendiculars, 350 ft.; beam, moulded, 45 ft.; depth, 28 ft. 6 in. The vessel has been built under special survey to class 100 A in Lloyd's Register, and is of the three-deck type, having a poop, bridge, and forecastle. Two complete steel decks are laid, extending all fore and aft. The poop is fitted for cargo, and the officers and engineers' are berthed on the bridge in a large steel deckhouse, and the crew in the forecastle. Water ballast is provided for aft in a cellular bottom, and in a deep hold tank amidships. All the necessary requirements to fit the vessel for general and grain cargoes are complied with, and all the most modern improvements for the safe handling of the vessel and rapid loading and discharging of cargo are supplied and fitted throughout. The vessel is designed to load a deadweight of about 5,600 tons on 23 ft. As the vessel left the ways she was gracefully christened the *Oriel* by Mrs. Gracie, of Liverpool. The company present to witness the launch included Admiral Cleveland, Mr. A. M. Palmer, Mr. Gracie, Mr. Talbot Baines, Mr. and Miss Hall, Captain Paine, Miss Robinson, Mr. and Mrs. Grove, and Mr. Grundy. An adjournment to the offices afterwards took place and the customary toasts were proposed by Admiral Cleveland. Mr. Gracie responded to the toast of success to the *Oriel*, and in congratulating the builders on the success of the launch, mentioned that the ship is the seven hundred and twentieth built by the Palmers Co.

Rover.—On February 3rd there was launched by Messrs. J. T. Eltringham & Co., at South Shields, a powerful steam tug, which they have built to the order of the Glasgow and Greenock Shipping Co. The new vessel, which will form an important addition to the company's towing fleet, is 110 ft. in length; 22 ft. in breadth; and 10 ft. in depth; and will be supplied by Messrs. Hepple & Co., South Shields, with powerful engines of the surface-condensing type. The ceremony of christening the new steamer was performed by Miss Blanche, daughter of the Greenock agent of the company.

Olaf.—On Thursday February, 4th, Messrs. Wm. Gray & Co., Limited, launched a fine steel screw steamer of the following dimensions, viz.:—Length, over all, 290 ft.; breadth, 39 ft. 6 in.; depth, 21 ft. She has been built to the order of Mr. L. H. Carl, of Copenhagen, and will take Lloyd's highest class. The deck erections consist of poop, bridge, and forecastle. A handsome saloon, state-room and accommodation for captain will be fitted up in the poop, and comfortable quarters for the engineers and officers amidships, and for the crew forward. The hull is built with deep frames and cellular double bottom, and with large ballast tank in the after peak. Four steam winches, large patent donkey boiler, steam steering gear placed in engine-room casing, hand screw steering gear aft, direct steam windlass, schooner rig, boats on beams overhead, grain divisions, and all improved appliances for working the steamer will be provided. The engines are of the triple-expansion type, working on three cranks, and are from the Central Marine Engine Works of Messrs. Wm. Gray & Co., Limited, the cylinders being 21 in., 33 in., and 56 in. diameter, with 36 in. piston stroke, and two large steel boilers to work at a pressure of 160 lbs. per square inch. The steamer has been superintended during construction by Captain C. A. Jorgensen, on behalf of the owners, and the ceremony of naming her *Olaf* was gracefully performed by Miss Gwendoline Nielsen, of West Hartlepool, niece of the managing owner.

Heronspool.—On February 4th Messrs. Pickersgill & Sons launched at Southwick a steel screw cargo steamer, of the partial awning deck type, of the following dimensions:—Length, 310 ft.; breadth, 42. ft 6 in.; depth, 21 ft. 9 in.; and has been built to Lloyd's highest class for vessels of this type. The machinery and boilers are being supplied by Messrs. Geo. Clark, Limited, of Southwick, the engines being of the triple-expansion type, having cylinders 21½ in., 36 in., and 60 in. diameter, by 42-in. stroke, and the two large steel boilers have a working pressure of 180 lbs. to the square inch. The vessel was christened *Heronspool*, and has been built to the order of Liverpool owners.

Anemone.—On February 4th Messrs. Day, Summers & Co. launched at the Northam Ironworks, Southampton, a screw steam yacht. Her leading dimensions are:—Length (l.w.l.), 90 ft.; breadth, 14 ft. 9 in.; depth, 8 ft. 2 in.; tonnage, 100 (builders' measurement); and she will be classed A1 at Lloyd's for 19 years. The yacht will have a compound surface-condensing engine, with cylinders of 10 in. and 20 in. diameter, and 16 in. stroke, with a working pressure of 100 lbs. She has been built to the order of Mr. E. Liddell, of Newton House, Chathill, Northumberland, from a design by Mr. A. H. Brown, naval architect, of Pall Mall, London. The new craft was christened *Anemone*.

Sorata.—On Friday afternoon, February 5th, there was launched from the East Shipbuilding Yard of Messrs. C. S. Swan & Hunter, Limited, of Wallsend, a fine steel steamer, built for the Pacific Steam Navigation Co., of Liverpool. This vessel, which was named the *Sorata*, is a duplicate of the steamer called *Corcovado*, recently delivered from the same yard. Her dimensions are 405 ft. in length by 47 ft. 3 in. beam by 32 ft. 9 in. depth. This vessel has been designed for the company's cargo trade between Liverpool and the West Coast of South America. She has a cargo capacity of about 6,700 tons deadweight, and will be fitted to the owners' highest standard in all respects, the cargo and mooring arrangements receiving special attention, nothing having been spared to ensure success in every department. She has nine special steam winches, also 11 cargo derricks and spans for quick despatch. There are three steel decks, the upper one being partially sheathed with teak. She has seven watertight bulkheads, and a cellular double bottom all fore and aft, divided longitudinally into ten compartments; also Hall's stockless anchors, Harrison's steam steering gear, and J. H. Wilson & Co.'s capstan. The machinery for the *Sorata* has been constructed by the Wallsend Slipway & Engineering Co., Limited, and has cylinders 24 in., 40 in., and 66 in. diameter, with 51 in. stroke, and three large boilers arranged for a working pressure of 190 lbs. per square inch. The economical working of the machinery has been very carefully considered, special feed-heaters, evaporators, with Weir's pumps, &c., being fitted; also manganeze bronze blades. During the construction of the vessel and machinery the work has been superintended by Captain Conlan and Mr. James Thomson, the company's marine and engineering superintendents, and also by Mr. Frank Fisher, the resident surveyor.

Polious.—On February 15th Messrs. R. & W. Hawthorn, Leslie & Co., Limited, launched at Hebburn-on-Tyne, a steel twin-screw passenger and cargo steamer to the order of the Eastern Carrying, Storing, Warrant and Insurance Co., of St. Petersburg, of the following dimensions:—225 ft. long; 32 ft. wide; and 14 ft. 4 in. deep. She is built to the requirements of Bureau Veritas, and designed and fitted throughout to meet the special Caspian Sea trade for which the company intend her. The vessel was named *Polious*, and is the first of four building.

Iron Lighter.—On February 17th Mr. Joseph Scarr, Grovehill, Beverley, launched an iron lighter of the following dimensions, viz.:—Length, 51 ft.; beam, moulded, 15 ft. 8 in.; depth, moulded, 7 ft. 6 in. She was built to the order of Messrs. Blundell, Spence & Co., of Hull.

Claudia.—On February 17th Messrs. Richardson, Duck & Co. launched from their yard a finely modelled steel screw steamer for the Tees Union Shipping Co.'s service, between Stockton, Middlesbrough and London. She is of the following dimensions:—Length, over all, 240 ft.; breadth, extreme, 33 ft.; depth, moulded, 17 ft. 6 in.; gross tonnage, 1,150 tons. Water ballast is fitted fore and aft in cellular double bottom and in after peak tank. The vessel is being built to class 100 A1 in Lloyd's Register, under special survey, and to meet the requirements of the Board of Trade for a "home trade" passenger certificate. She has a long poop containing accommodation for 50 first-class passengers, with large dining saloon and ladies' cabin, a large smoke-room being fitted on poop deck. Berths will be provided for 50 second-class passengers in topgallant forecastle, which also contains a deck shelter for about 40 deck passengers and the crew's galley. Officers and crew will be berthed in bridge amidships. The accommodation for first-class passengers will be handsomely fitted up. There will be private cabins for ladies, the lavatory arrangements will be of a complete character, and the cabins and saloon will be heated by steam. A complete installation of electric lighting is being fitted by Messrs. J. H. Holmes & Co., of Newcastle, including cargo, masthead and side lanterns. The vessel has two holds and three hatches, and equipment includes three steam winches of special design, each having a separate winch for working the guy gear; steam windlass, stockless anchors, steam steering gear, etc. The engines are by Messrs. Westgarth, English & Co.; cylinders 24 in., 37 in., 62 in. by 39 in. stroke; two single-ended boilers, working at 160 lbs. pressure, the vessel being intended to maintain a high rate of speed between ports. Boilers will be fitted with Howden's system of forced draught, also a feed-water filter and Harman's feed-water heater and circulator. As she was leaving the ways she was christened *Claudia* by Mrs. Arthur H. Whipham, of Saltburn-by-the-Sea.

Ohiwa.—On Wednesday, February 17th, Messrs. Furness, Withy & Co., Limited, launched from their Middleton Shipyard, Hartlepool, a large steel screw steamer of handsome design. She is a fine type of a modern cargo boat, measuring over 350 ft. in length, and built throughout of Siemen's-Martin steel, with a large measurement and deadweight capacity of about 6,300 tons, built to the highest class at Lloyd's. The vessel is of the single-deck type, with poop, bridge and forecastle. The holds are fitted with iron grain divisions and all deck erections, skylights, bulwarks, etc., are constructed of steel and iron. Cellular double bottom fitted fore and aft for water ballast, the after peak being also available as a tank. The greater portion of the plates are in 24 ft. lengths, making the structure of the ship very strong. Four large powerful winches, donkey boiler, patent steam steering gear amidships, screw gear aft, direct steam patent windlass, stockless anchors hauling into hawse pipes and other modern appliances are fitted for the handy working of the ship. The saloon and cabin providing accommodation for the captain, etc., is handsomely finished in polished hardwood. The vessel will be rigged as a two-masted fore-and-aft schooner, and will be fitted with triple-expansion engines of massive design with every provision for economical working, by Messrs. W. Allan & Co., Limited, Sunderland. On leaving the ways she was gracefully christened *Ohiwa* by Mrs. Henry Withy, Brantford House, West Hartlepool.

Tunstall.—On Thursday afternoon, February 18th, the s.s. *Tunstall* was launched from the yard of Messrs. Craig, Taylor & Co., Thornaby-on-Tees. The dimensions are:—280 ft. by 41 ft. by 18 ft. 9 in., and she is a duplicate of the s.s. *Urania*, which was launched a short time ago by the same builders. This vessel will carry 3,100 tons on a very light draught of water, and will be fitted with powerful steam winches, patent direct steam windlass, steam steering gear, and all modern improvements. The engines are being constructed by Messrs. Sir Christopher Furness, Westgarth & Co., Limited, Middlesbrough, the cylinders being 20 in., 32½ in., 53 in. by 36 in. stroke, with two large boilers to work at 160 lbs. pressure. The vessel has been built to the order of Messrs. Furness, Withy, & Co., Limited, West Hartlepool. The christening ceremony was performed by Miss Bessie Craig, daughter of one of the builders.

Ashanti.—On Friday afternoon, February 19th, there was launched from the West yard of Messrs. C. S. Swan & Hunter, Limited, a steel screw steamer, built to the order of Messrs. Elder, Dempster & Co., for their Transatlantic trade. The vessel has been designed to carry a deadweight cargo of 5,600 tons on a moderate draught, and to carry a very large measurement cargo. Her dimensions are:—330 ft. between perpendiculars, by 45 ft. 3 in. by 28 ft. 9 in. moulded; built to the highest class at Lloyd's; spar-deck rule, under special survey. She has a poop, long bridge and topgallant forecastle. On the top of the bridge in steel houses are placed the accommodation for the officers, engineers, &c., whilst the crew are located in the forecastle. Water ballast will be carried in the cellular double bottom; six powerful steam winches by Messrs. Wilson, of Liverpool are supplied, with a full complement of derricks and discharging gear. The steam windlass is of Messrs. Emerson, Walker & Co.'s latest design, whilst a special type of steering gear by Messrs. Bow, McLachlan & Co., placed aft and controlled from the bridge, will be fitted. The machinery is of the latest type of triple-expansion engines built by the North-Eastern Marine Engineering Co., Limited; her cylinders are: 24 in., 40 in., and 64 in. diameter, by 42 in. stroke, supplied with steam by two large single-ended boilers, 15 ft. 3 in. diameter by 10 ft. 6 in. long, working at a pressure of 170 lbs. per square inch. During the construction the steamer has been surveyed by Captain Evans, the company's marine superintendent; whilst the construction of the machinery has been supervised by Mr. Lees, the engineer surveyor for Messrs. Elder, Dempster & Co. On leaving the ways the steamer was christened the *Ashanti* by Mrs. Henry H. Aitchison, of Park Villa, Wallsend.

LAUNCHES—SCOTCH.

Oakburn.—On January 25th Messrs. Russell & Co. launched at Port-Glasgow, to the order of Messrs. R. Shankland & Co., Greenock, the three-masted steel barque *Oakburn*, of the following dimensions:—Length, 246 ft.; breadth, 37½ ft.; depth, 22½ ft.; is 1,500 tons net register, and will carry 2,800 tons deadweight. Captain Young superintended construction.

Steam Ferryboat.—On January 28th Messrs. S. M'Knight & Co., Limited, launched from their building yard at Ayr a cross-river steam ferryboat, to carry about 400 passengers, for the Renfrew Harbour Commissioners. Her dimensions are: Length, 56 ft.; breadth, 38 ft. 6 in. She is strongly built, has a carriage way in centre, and a raised deck on each side for passengers, and is divided into ten watertight compartments. At each end a large entrance platform is fitted having steam lifting gear. The machinery department has been supplied by Messrs. Lees, Anderson & Co., Anderston, Glasgow. Both hull and machinery were designed by Mr. James Donaldson, consulting engineer, Glasgow.

Newhaven, Oxford, and Peterborough.—On January 29th Messrs. Mackie & Thomson launched, from their yard at Govan, three steel fleeters, the *Newhaven*, the *Oxford*, and the *Peterborough*, for Messrs. Hagerup, Doughty & Co., Grimsby. The vessels are similar to those already built by Messrs. Mackie & Thomson for the same owners, and are each of about 164 tons gross. The engines are triple-expansion, and are by Messrs. Muir & Houston, Kinning Park.

Glenpark.—On January 30th a steel sailing ship of 1,959 gross tonnage, named the *Glenpark*, was launched at Port-Glasgow for Messrs. Sterling & Co., of Port-Glasgow.

Bittern.—On February 2nd there was launched from the yard of the Caledon Shipbuilding and Engineering Co., Limited, Dundee, a steel screw steamer, built to the order of the Cork Steamship Co., Limited, of Cork. The vessel has been built to the highest class at Lloyd's, and is of the following dimensions:—Length, over all, 229 ft.; breadth, 32 ft.; depth in hold, 15 ft. 8 in. Her engines, constructed at the builders' Lilybank Engine Works, are triple-expansion, having cylinders 19 in., 30 in., and 50 in. diameter respectively, with a piston stroke of 33 in. Steam is supplied by one large steel boiler at a pressure of 160 lbs. per square inch. She has a combined poop and bridge deck, and topgallant forecastle. Three large hatchways afford access to the holds, four steam cranes, and two steam winches being placed at hatchways for handling cargo. The cabin is aft under the poop deck, and is very comfortably arranged for captain and officers, having saloon in centre panelled in mahogany and sycamore, relieved with satin wood mouldings, and upholstered in crimson velvet. The engineers' rooms are amidships, and the crew and firemen are berthed forward in the 'tween decks. Steam steering gear by Messrs. Alley & Maclellan has been provided in the wheel-house, from which the vessel can be steered either by hand or steam. On the forecastle is a powerful steam windlass for working the anchors, which are of a stockless pattern, and stow into the hawse pipes. The vessel is rigged as a two-masted schooner, and is fully equipped to meet Lloyd's and Board of Trade requirements, and everything has been done to make her a first-class cargo boat. The work has been carried out under the supervision of Mr. Kelson and Captain Hore, the company's superintendents, assisted by Mr. Flockhart, one of the Cork Steamship Co.'s engineers. As the vessel left the ways she was christened the *Bittern* by Mrs. Grat Barclay, Broughty Ferry. Amongst the others present were Mr. and Mrs. Tawse, Mr. F. C. Kelson (Liverpool), Mr. and Mrs. W. B. Thompson, Mr. O. P. Thompson, Mr. J. W. Reid, Mr. D. Robertson (Broughty Ferry), &c. At the close of the ceremony the company adjourned to the manager's office, where "Success to the *Bittern*" was heartily pledged.

Kilrenny.—On February 3rd Mr. Jarvis launched from his shipbuilding yard a steam liner, built to the order of the Kilrenny Steam Fishing Co., Limited. Her dimensions are:—Length, 96 ft.; breadth, 19 ft. 1 in.; and depth, 10 ft. 4 in. The engines are to be fitted on board at Leith. The vessel has been made complete with ice-house and fish-rooms. She was named the *Kilrenny* by Miss Leslie, St. Ayle's.

Deccan.—On February 3rd Messrs. R. Duncan & Co., Limited, launched from their shipbuilding yard, Port-Glasgow, a full-rigged three-masted steel sailing ship of 3,300 tons deadweight for the British and Eastern Shipping Co., Limited, of Liverpool, (Mr. Jas. Macdonald, managing director). She was named the *Deccan* by Mrs. Robert Duncan, of Redholme, as she left the ways, and is intended for the Eastern and Colonial trades.

Spray.—On February 3rd Messrs. John Fullerton & Co. launched at Merksworth, Paisley, a steel screw steamer for Messrs. R. & W. Paul, Limited, Ipswich, for their towing trade to and from that port. Compound engines are to be supplied by Messrs. Ross & Duncan, Govan. The steamer is named the *Spray*, Mr. James Donaldson, Glasgow, superintended the steamer while under construction.

Balgowan. — On February 4th there was launched by the Dundee Shipbuilders Co. a steel screw steamer, which has been built to the order of Messrs. William Kinnear & Co., shipbrokers, Dundee. The vessel, constructed to the highest class at Lloyd's, is 125 ft. long, 22 ft. in breadth, and 10 ft. deep, and will have a carrying capacity of 320 tons. Her engines will be of 300 I.H.P., and they have been constructed by Messrs. Alexander Hall & Co., Aberdeen. She was named the *Balgowan*.

Taymount.—On February 5th Messrs. A. Rodger & Co., Port-Glasgow, launched a sailing vessel to the order of Messrs. Robt. Ferguson & Co., Dundee. Dimensions:—Length, 245 ft.; breadth, 37 ft. 6 in.; depth, 22 ft. 6 in. The register tonnage is 1,480 tons, and the deadweight carrying capacity about 2,800 tons. Miss D. Thompson, Osborne Place, Dundee, performed the ceremony of naming the vessel *Taymount*. After fitting out at Port-Glasgow, the vessel will proceed to Liverpool, under command of Captain Padley, to load for San Francisco.

Audaz.—On February 6th the Clydebank Engineering and Shipbuilding Co., Limited, launched from their yard at Clydebank a twin-screw torpedo-boat destroyer built to the order of the Spanish Government. The vessel, which was named the *Audaz*, is of a greater tonnage than the *Furor* and *Terror*, lately delivered from the same yard, and will carry the same armament, but she will be two knots faster. His Excellency Commodore Camara, chief of the Spanish Naval Commission in London, and officers were present as representing the Spanish Government, and the christening ceremony was performed by Mrs. Hardcastle and Mrs. F. H. R. Sawyer, it being considered appropriate, probably for the first time, that a twin-screw vessel should have a twin christening. A luncheon followed in the model-room, and the customary toasts were duly honoured.

Kerry.—On Saturday, February 6th, Messrs. Blackwood & Gordon, engineers and shipbuilders, launched from their building yard at Port-Glasgow a handsome steel screw steamer, for service in the cross-channel trade between Ireland and England. This steamer has been built to the order of the City of Dublin Steam Packet Co., of Dublin, for their Dublin and Liverpool trade, and is a sister ship to the steamers *Louth*, *Wicklow*, and *Carlow*, also constructed by Messrs. Blackwood & Gordon for the same owners. On leaving the ways the vessel was named *Kerry* by Mrs. D. B. M'Geoch, wife of the senior partner of the builders, and was afterwards taken into the builders' wet dock to receive her machinery, which has also been constructed by the builders. Her dimensions are:—Length, 260 ft.; breadth, 34 ft.; depth, 16 ft. 9 in.; with long poop, bridge, and forecastle, and short wells filled in, and having a tonnage of 1,270 tons gross register. Engines of the triple-expansion type, with bronze propeller and large boilers, working up to fully 3,000 H.P., will be fitted. The hull of the vessel has been built very much in excess of the requirements of Lloyd's class, and is fitted with powerful steam windlass, steam steering gear, and steam winches, &c. In the holds, 'tween and main decks, fittings are arranged for fully 500 cattle, and on the upper deck sheep fittings are arranged. Efficient ventilation by means of fans and ventilators has been provided so as to insure the safe and comfortable transit of cattle, special attention being given to this very important matter by the builders in accordance with the views of the managing directors, and in compliance with the new orders in Council regarding cattle transit. In the after part of the vessel a large house on poop deck has been fitted with private cabins for the accommodation of 30 first-class passengers, and entering from this house is the main saloon, having accommodation for other 70 passengers, making 100 in all. The saloons are nicely fitted up and upholstered in velvet, and electric light is fitted up throughout all parts of the vessel. In the centre part of the vessel on bridge deck a pleasant smoking-room is arranged, and over the same a teak house is fitted with rooms for the captain and chief officer. Above this house is placed the flying bridge, from which, on account of its height, the captain and officers will be able to keep a look out. After the launch the company met in the builders' model room, when luncheon was served. Amongst those present were:—Mr. and Mrs. Bell, Liverpool; Mr. and Mrs. D. B. M'Geoch, Mr. and Mrs. F. P. Purvis, Mr. and Mrs. Craig, Gourock; Miss Gordon and Miss Kelly, Port-Glasgow; Messrs. Charles M. Duncan and William M'Laren, Glagow. Mr. M'Geoch proposed, "Success to the *Kerry*." He said this was the fifth steamer they had built for the City of Dublin Steam Packet Co. The experience of the steamers they had previously constructed for the company spoke very highly for, how they had carried out their contracts for that company. The steamers built by them had been very successful, and had proved great favourites not only with the travelling public but with cattle dealers. He had no doubt the *Kerry* would maintain the prestige of the company, and be as great a favourite as her predecessors. He might add that the first of the new steamers built for this company for carrying her Majesty's mails had just gone her trial trip, when a speed of 23½ knots was attained. He had no doubt that when these four new steamers were on their stations they would prove superior to the old paddle-boats. Captain Bell, representing the owners, in reply, said the *Kerry* was the best type of steamer for the cattle trade that is running between England and Ireland. She was also well adapted for passenger and perishable traffic. Their trade between Liverpool and Dublin had increased enormously. The ventilation of the steamers was perfect, and the electric light had been introduced into all of them. They were, therefore, suitably equipped for passenger, cattle, cargo, and perishable traffic. He had much pleasure in proposing the health of Mrs. M'Geoch, who had so graciously named the boat that day. Mr. M'Geoch suitably replied.

Queenstown and Richmond.—On February 16th Messrs. Mackie & Thomson launched from their yard at Govan two steam fleeters—the *Queenstown* and the *Richmond*. The vessels, which are of about 160 tons each, are a further instalment of the fleet being built in the yard for Messrs. Hagerup, Doughty & Co., Grimsby. Messrs. Muir & Houston, Kinning Park, will supply triple-expansion engines.

Excelsior.—On February 17th there was launched by Messrs. Gourlay, at Dundee, a steamer which has been built to the order of Mr. G. W. Nicoll, shipowner, Sydney. She is about 400 tons net register, and has been constructed to the highest requirements at Lloyd's. Triple-expansion engines will be supplied, and the speed of the vessel will be from 10 to 12 knots per hour. She was named the *Excelsior*.

Andria.—On February 18th the Ailsa Shipbuilding Co. launched a very handsome steel screw steam yacht, designed by Mr. G. L. Watson, for Mr. John E. Brooks, an American gentleman. Her dimensions are 161 ft. by 23 ft. 3 in. by 14 ft. 3 in. moulded depth, and she will be fitted by Messrs. D. Rowan & Son with triple-expansion engines, having cylinders 16 in., 26 in. and 41 in. diameter, with a stroke of 27 in. She is to have a complete installation of electric light, and will be fitted throughout with every modern appliance for the comfort of the owner and guests, and for the safe and efficient navigation of the ship. The christening ceremony was gracefully performed by Mrs. Brooks, the name given being *Andria*.

Scarborough.—On February 18th Messrs. Mackie & Thomson, Govan, launched the steam fleeter *Scarborough*, the 19th vessel of the fleet they are building for Messrs. Hagerup, Doughty & Co., Grimsby.

Rosabelle.—On Thursday, February 18th, Messrs. Ramage & Ferguson, Limited, launched from their yard at Leith a new auxiliary yacht of about 440 tons yacht measurement, which they have built to the order of Mr. Theodore Pim, of Marten's Grove, Crayford, Kent, from the designs of Messrs. Cox & King, Pall Mall, London. The yacht is of composite construction, and is built to the highest class in Lloyd's Yacht Register, having steel framing and plating, all teak planking and copper fastenings, and the whole has been carried out under the personal supervision of Mr. J. E. Wilkins. Her principal dimensions are:—Length over all, 167 ft.; length between perpendiculars, 141 ft. 6 in.; breadth, extreme, 26 ft.; inside depth, 14 ft. The vessel will be rigged as a top-sail-yard schooner, and as a steadier she has an outside hanging keel of 50 tons weight of lead. The propelling machinery consists of inverted, direct-acting surface-condensing, triple-expansion engines, with cylinders 13 in., 21 in., and 33 in. diameter, and a stroke of pistons of 22 in. A notable feature in the yacht will be the water-tube boilers, of which there will be two, placed side by side, each boiler having over 1,000 square feet of heating surface. These have been constructed by Messrs. Yarrow & Co. to work under natural draught only, and at a working pressure of 160 lbs. per square in. The owner's accommodation comprises state-rooms forward of the machinery space, with separate bath-rooms, and a deck-saloon above. Immediately abaft the machinery is a spacious dining-saloon, five other state-rooms with separate bath-room, and an elegant drawing-room at extreme after end. The whole of the interior fittings are made in choice hardwoods, with the exception of owner's personal state-rooms, dining-saloon, and drawing-room, the walls of which will be covered with silk broché tapestry. The yacht will have installations of electric lighting, with search light, and hot water heating with all latest improvements, and the equipment includes steam windlass, steam and hand-combined steering gear, steam winch on main mast, &c., &c. On leaving the ways the yacht was named *Rosabelle*, the naming ceremony being gracefully performed by Mrs. Pim. After the launch the builders entertained Mr. and Mrs. Pim and friends to cake and wine, when the customary toasts were given.

Leon Pauilhac.—On Saturday, February 20th, Messrs. Ramage & Ferguson, Limited, Leith, launched from their yard a handsome steam yacht of 307 tons, built to the order of Mons. G. Pauilhac, Toulouse, from the designs of Mr. St. Clare Byrne, Liverpool. The dimensions of the yacht are:—Length, between perpendiculars, 144 ft., by 21 ft. beam, by 12 ft. moulded depth, and the triple-expansion machinery is of the builder' special design for yachts, having cylinders 13 in., 21 in., 34 in. diameter, and 24 in. stroke, steam being supplied from a large multitubular boiler working at 170 lbs. pressure. The owner's accommodation consists of large dining-saloon fitted forward, and several commodious state-rooms both forward and aft of machinery space, the whole being panelled in choice hardwoods and tapestries. The yacht is fitted with all the most modern improvements, having steam launch, steam windlass, electric light installation, &c. On leaving the ways the yacht was named *Leon Pauilhac* by Mrs. St. Clare Byrne, and afterwards the builders entertained a large company to cake and wine, when the toasts usual on such occasions were duly honoured.

LAUNCH—Irish.

Rotterdam.—On February 18th Messrs. Harland & Wolff launched at Belfast the large twin-screw steamer *Rotterdam*. The new steamer is built to the order of the Holland American Line, to run between Rotterdam and New York, and, besides being a very large cargo carrier, will have superior accommodation for a considerable number of passengers. The vessel has gross tonnage of about 8,200 tons. The most modern improvements will be introduced for the comfort and convenience of passengers. The vessel will be fitted with refrigerating chambers, and every facility will be provided for rapid loading and discharging of cargo.

LAUNCH—German.

Aragonia.—On January 28th a cargo and passenger steamer, *Aragonia*, built for the Hamburg-America line, was launched from the ways of the Flensburger Schiffsbau Gesellschaft. Her dimensions are:—420 ft. by 50 ft. by 33 ft. and to class at British Lloyd's 100 A1. Twin-screw, 1,800 H.P. On leaving the ways she was christened by Mrs. Aldag.

TRIAL TRIPS.

Theben.—On January 16th the new cargo and passenger steamer *Theben*, built by the Flensburger Schiffsbau-Gesellschaft for the "Kosmos" line in Hamburg, was taken on her trial trip. The steamer has dimensions, 383 ft. by 46 ft. by 30 ft. 8 in., and is built to British Lloyd's class 100 A1. She is fitted with highly-finished cabin arrangements for 30 first-class passengers and also for emigrants. With the quadruple engines of 1,750 H.P. she made an average speed of 12 knots.

St. Hilda.—On January 23rd the new steam fishing vessel *St. Hilda*, built by Messrs. Wood, Skinner & Co., of Bill Quay on Tyne, to the order of the St. Hilda Steam Fishing Co., Limited, of Hartlepool, was taken to sea for her trial trip, when the machinery, constructed by the North-Eastern Marine Engineering Co., worked smoothly, and on the measured mile a mean speed of 11 knots was attained.

Leopoldville.—On Saturday, January 30th, the Belgian Royal Mail steamer *Leopoldville*, built by Messrs. Sir Raylton Dixon & Co., Cleveland Dockyards, Middlesbrough, to the order of Messrs. Elder, Dempster & Co., of Liverpool, for the Compagnie Belge Maritime du Congo of Antwerp, proceeded to sea under the command of Captain Morgan for her official trial trip. She is a very handsome model of yacht-like appearance, built with lines to maintain a good rate of speed, and is intended for the line running with the mails and passengers from Antwerp to the Congo and West Coast of Africa. Her dimensions are:—Length, 364 ft.; breadth, 44 ft.; depth, 26 ft. The *Leopoldville* is one of the most elaborately fitted and decorated vessels that have left the Tees, and is specially arranged for the comfort of passengers in a very hot climate. Her decks are all of teak, and a poop and bridge of over 250 ft. in length and 8 ft. high, is devoted entirely to cabin accommodation. There are also three large houses above this for the first-class dining-saloon, first-class smoking-room, second-class smoking-room, and cabin entrance. Over the dining-saloon house and alongside engine and boiler casing a teak shade deck extends to the sides of the vessel, so as to give protection from the sun; this deck also forms a spacious passenger promenade under a protecting awning. The captain's cabin and steering house are both upon this deck, and over them again is the navigating bridge of the vessel. The cabins are entered by a spacious entrance hall, panelled in carved walnut and inlaid wood of very artistic design, with sofa seats and small tables. The first-class dining-saloon is arranged to accommodate over 100 passengers, and is fitted with a number of small tables so that the passengers can arrange themselves in private parties. This saloon is most elaborately panelled in marble of various colours, with woodwork of beautifully carved mahogany, the fittings, being of copper bronze; the whole having a most artistic effect. A piano is placed at the end of the saloon and both oil and electric lamps are fitted throughout. The staterooms are fitted in the poop below, with a wide corridor extending up the centre, and having an open grated sliding door in front, so as to obtain splendid ventilation, iron doors also being fitted so that this can be closed in bad weather. A separate ladies saloon is very handsomely fitted, and all the bath-room and sanitary arrangements are of the most complete description, the baths being of porcelain, the floors and sides of the rooms being covered with encaustic tiles. The second-class saloon is placed aft, being panelled in teak and enamel, with tables and revolving chairs to accommodate 60 passengers. The smoke-rooms on deck are very tastefully fitted and panelled in carved oak and marble. The ship is lighted throughout by the electric light and is also provided with refrigerating machinery and a large cooling chamber for the conveyance of fresh meat and provisions; in fact, no expense has been spared to complete her in the most perfect way in every detail. Her engines, of 2,000 H.P., have been made by Messrs. Thomas Richardson & Sons, Limited, of Hartlepool, and her boilers are fitted with Howden's patent forced draught. The trial in every way proved satisfactory, and the vessel proceeded direct for Antwerp, from whence she sailed with mails and passengers on February 6th.

Fitzclarance.—On February 2nd the large new screw steamer *Fitzclarance*, built by the Tyne Iron Shipbuilding Co., Limited, Willington Quay, to the order of Messrs. Burrell & Son, Glasgow, left the Tyne for her official loaded trial trip. She is 365 ft. long by 47 ft. beam, by 29 ft. 9 in. draught, and her deadweight carrying capacity is over 7,000 tons. The propelling machinery, which has been built by the North-Eastern Marine Engineering Co., Limited, Wallsend-on-Tyne, consists of a set of triple-expansion engines, having cylinders 27 in., 43 in., and 72 in., by 45 in. stroke, and two large single-ended natural draught boilers, working at a pressure of 170 lbs. per square inch. The trial of both vessel and machinery proved in every way satisfactory. The vessel attained a speed of over 11 knots, despite the unfavourable state of the weather. After the trial the vessel proceeded on her voyage to America.

Anping.—On February 3rd the *Anping*, a passenger and cargo screw steamer which has been constructed by Messrs. Wigham Richardson & Co., to the order of the Osaka Shosen Kabushiki Kaisha, of Osaka, Japan, went for a successful trial off the coast. This vessel is 261 ft. in length by 35 ft. beam by 23 ft. in depth, and is rigged as a two-masted fore-and-aft schooner, and having accommodation for first and second-class passengers in a bridge amidships and in a poop, and there are also fittings for a large number of steerage passengers. She is lighted throughout by the electric light. The propelling machinery consists of a set of triple-expansion engines, which on the trial trip worked without a hitch, driving the vessel at a mean speed of over 11 knots, the vessel being fully loaded. The owners were represented on the trial trip by Mr. S. Konishi, their superintendent engineer, under whose superintendence the vessel has been constructed.

Conqueror.—On February 5th the new paddle steamer *Conqueror*, which is intended for the summer passenger service between Ramsgate, Margate, Deal and Boulogne, was taken on her official trial trip off the Tyne. The owners were represented by Captain R. Andrews, of Margate, and Mr. H. Sandford, of Gravesend. The sea was exceedingly rough outside, but the vessel behaved admirably. Owing to the stormy nature of the sea she was unable to run the measured mile. The vessel was designed, built and fitted by Messrs. J. T. Eltringham & Co., Stone Quay, South Shields, and is equipped with all the latest appliances. Mr. William Hepple, also of South Shields, supplied the engines, and the machinery worked without a hitch.

Lulmira.—Lately the s.s. *Lulmira*, built by Messrs. Ritchie, Graham & Milne, Whiteinch, went down the Clyde for her trial trip. The little vessel is 60 ft. long, between perpendiculars, by 12 ft. beam, by 6 ft., moulded depth, and is fitted with a pair of compound surface-condensing engines having cylinders 9 in. and 18 in. diameter by 12 in. stroke. She is fitted with two teak deck-houses aft for accommodation of captain and officers, awning-deck and side curtains, and the usual deck fittings and outfit suitable for trade on the Amazon River. The vessel has been built to the order of Messrs. Vianna & Co., London, for a client in Para, North Brazil, and is intended for service on the Rio Madeira, a branch of the Amazon. Mr. Wm. J. Norris, M.I.N.A., of London, superintended the construction of the hull and machinery and was present at the trials, when a mean speed of 9·89 miles per hour was obtained over six runs on the measured mile. The vessel then proceeded to Glasgow to have her machinery taken out, after which she will be shipped on deck of export steamer to Demerara and lifted into the water there, the machinery fitted on board, and the vessel steamed to Para.

Orotava.—On February 5th the s.s. *Orotava*, built by Messrs. William Dobson & Co., Limited, of Low Walker, went on her trial trip, which proved satisfactory in every way, the vessel attaining a speed of 13 knots. She has been constructed to the order of the Mersey Steamship Co., Limited, for their Madeira and Canary Islands service from London, and is specially designed for the passenger and fruit-carrying trade, has spacious and luxurious accommodation for 45 first-class passengers. The vessel is fitted throughout with electric light. The dimensions are:—Length, 242 ft.; breadth, 35 ft.; depth, 27 ft. She is flush decked, with saloon and passenger accommodation amidships, the crew being quartered aft. The propelling machinery, constructed by Messrs. J. Dickinson & Sons, Limited, of Sunderland. The engines have cylinders 19½ in., 32½ in., and 54 in. in diameter by 39 in. stroke, and the boiler is fitted with forced draught arrangement. The vessel and machinery throughout have been constructed to the specifications and under the supervision of Messrs. William Esplen & Son, consulting engineers and naval architects, of Liverpool and London.

Takao.—On Monday, February 8th, the steamer *Takao*, built by Messrs. Wigham Richardson & Co. to the order of the Osaka Shosen Kabushiki Kaisha went for a very successful trial trip off the Tyne. The *Takao* is a sister ship to the *Anping*, also built by Messrs. Wigham Richardson & Co. for the same owners, and a description of which has already appeared in these columns. During the trial the machinery worked without the slightest hitch, giving satisfaction to both owners and builders. The owners were represented at the trial trip by Mr. S. Konishi, under whose superintendence the vessel, with her engines and boilers has been constructed.

Socotra.—On February 10th the s.s. *Socotra*, built by Palmers Shipbuilding and Iron Co., Limited, to the order of the P. & O. Steam Navigation Co., Limited, was taken to sea for her official steam trials. Her dimensions are as follows:—Length, between perpendiculars, 460 ft.; beam, 52 ft.; moulded depth, 33 ft. 6 in. The vessel is of the three-deck type with poop, bridge and forecastle, and has been built under special survey to class 100 A1 at Lloyd's, and to comply with the Admiralty requirements for transport service. The upper and main decks are of steel and wood sheathed all fore-and-aft, and the lower deck is laid throughout the cargo holds. A double bottom is fitted on the cellular system for water ballast, extending all fore-and-aft, and the hull is subdivided by a large number of watertight steel bulkheads. She is handsomely and comfortably fitted and ventilated throughout in a manner suitable for service in warm climates. The officers and engineers are berthed along the sides of the bridge-house, and the crew in the topgallant forecastle. The vessel is fitted with all the most modern improvements, including steam cranes, winches, &c., for rapid loading and discharging, and is lighted throughout by electricity. She is designed to load about 6,000 tons deadweight on Lloyd's summer freeboard. The engines which have also been constructed by the Palmer Co. are of the triple-expansion type, with cylinders 22½ in., 36½ in., 60 in., and 48 in., driving twin-screws, and two boilers with Howden's forced draught. During the trial the engines worked in a highly satisfactory manner at 83 revolutions per minute, and a mean speed of 13½ knots was attained on the measured mile, and continued for several hours.

Jacob Bright.—On Wednesday, February 10th, the new steel screw steamer *Jacob Bright*, recently launched by Messrs. Irvine & Co., of West Hartlepool, proceeded on her trial trip. She has been built for the Jacob Bright Steamship Co., Limited, W. Leatham Bright, Esq., of London, managing owner. The owner was represented by Mr. Sage, superintendent, and Mr. Catt, secretary for the company, who together with the captain expressed themselves very highly satisfied with the finish of both the hull and machinery. Her dimensions are:—314 ft. by 44 ft. by 23 ft. 3 in., with a gross tonnage of 2,718 tons, and has been built to Lloyd's highest class. Her deck erections consist of poop, bridge, and topgallant forecastle. The saloon and cabins for captain and officers are fitted up in poop. The engineers are berthed under bridge-deck at sides of engine-room. Crew in topgallant forecastle. A cellular double-bottom extends fore-and-aft for water ballast. In order to provide for rapid loading and discharging four powerful steam winches by Irvine & Co., have been placed at hatchways, with double derricks to suit. Steam steering gear amidships, screw gear aft. Two large donkey boilers and direct steam windlass. Boats are placed on beams overhead. Triple-expansion engines by the Central Marine Engine Works have been fitted, cylinders 23 in., 36½ in., 63 in. by 39 in. stroke. After cruising about for some time adjusting the compasses, the vessel's speed was tested, when an average of 10¾ knots was attained. She then proceeded under the command of Captain Mills to Cardiff for loading. Manchester is the port of registry.

Gallia.—On February 11th the fine steel screw steamer *Gallia* left the port for her trial trip. She has been built by Messrs. Wm. Gray & Co., Limited, for Messrs. Hecksher & Son, of Copenhagen, and takes Lloyd's highest class. Her length is 290 ft.; breadth, 40 ft.; and depth, 20 ft. The deck erections consist of short raised quarterdeck, bridge, and topgallant forecastle. A handsome saloon, state-room, captain's room, &c., have been fitted up in a large deck-house on the bridge. The sides of the vessel are built with deep frames, a cellular double bottom is fitted, and large ballast tank in after peak. Five steam winches, patent donkey boiler, steam steering gear placed in engine-room casing, hand-screw steering gear aft, direct steam windlass, schooner rig, boats on beams overhead, iron grain divisions, and all improved appliances for working the steamer have been provided. The engines are of the triple-expansion type, supplied by the Central Marine Engine Works of Messrs. Wm. Gray & Co., the cylinders being 20 in., 31½ in., and 53 in. in diameter, with a piston stroke of 36 in., and steam is supplied by two large steel boilers at a pressure of 160 lbs. per square in. The ship was in charge of Captain Nielsen, and there were present Mr. E. E. Hansen, the firm's superintendent; Captain Jorgensen, superintendent engineer for Mr. L. H. Carl, of Copenhagen; Captain Murrell, representing the shipbuilders; and Mr. Thomas Mudd, on behalf of the engine builders. After the usual manœuvring of the ship to enable Mr. Berry to adjust the compasses, a full speed run was made for about two hours, when the engines ran at 86 revolutions per minute. The vessel then proceeded to Blyth to load, where she arrived the same evening, everything having worked in a most satisfactory manner.

Arranmoor.—On February 13th the new steamer *Arranmoor*, built by Messrs. John Blumer & Co., of Sunderland, to the order of the South Shields Steam Shipping Co., Limited, of which Messrs. Walter Runciman & Co. are the managers, proceeded to sea for her official trial trip. Her dimensions are:—Length, 290 ft.; breadth, 42 ft.; depth moulded, 19 ft. 4 in. The engines and boilers have been built by Messrs. John Dickinson & Sons, Limited, Sunderland, having cylinders 22 in., 36 in., and 59 in., with 39 in. stroke, and throughout the whole trial worked without a hitch. The trial proved satisfactory in every way, a speed of 11½ knots being obtained, after which the vessel proceeded to the Tyne to load her first cargo for the River Plate.

Injeniero Hyatt.—On Monday, February 15th, the official trial of the second first-class torpedo-boat (*Viper* type), built by Messrs. Yarrow & Co., for the Chilian Government, the *Injeniero Hyatt*, took place at the mouth of the Thames, when a speed of 27·2 knots was obtained over the Maplins, with a pressure of steam of 195 lbs. This vessel, and the torpedo-boat *Cirujano Videla*, tried last month, will be rapidly fitted out to join the Chilian Squadron, which will shortly leave this country.

Afghanistan.—On February 15th the steamship *Afghanistan*, a fine steel screw steamer, built by Messrs. Wm. Gray & Co., Limited, for Messrs. Frank C. Strick & Co., of Swansea and London, left the port for her trial trip. Her principal dimensions are:—Length, over all, 316 ft.; breadth, extreme, 43 ft.; and depth, moulded, 20 ft. 10 in.; and she is classed A1 at Lloyd's. The type of vessel is that of partial awning deck, with raised quarterdeck and poop, and the rig fore-and-aft schooner, with telescoping top masts. Very tasteful cabin accommodation has been provided under the poop, consisting of saloon, state-rooms, captain's and officers' rooms. The engineers' quarters are amidships and the crew's berths forward. The machinery has been supplied by the Central Marine Engine Works of Wm. Gray & Co., the engines being of the triple-expansion type, having cylinders 23 in., 36½ in., and 62 in. in diameter, and a piston stroke of 39 in. Steam is supplied by one large boiler working at 160 lbs. pressure, and fitted up with Howden's system of forced draught. There were present Mr. Archibald Walker, the firm's superintendent, under whose supervision the vessel and her machinery have been constructed; Captain Murrell and Mr. T. Mudd, representing the builders of the ship and engines respectively. After adjustment of compasses a full-speed trial was made, when everything was found in perfect order and to work to the entire satisfaction of those on board. After the trial the vessel at once proceeded on her voyage to Cardiff to load.

Kirriemoor.—On February 18th the new steamer *Kirriemoor*, built by Messrs. John Readhead & Sons, West Docks, South Shields, to the order of Messrs. Walter Runciman & Co., of Newcastle, had her trial trip off the Tyne. The dimensions of the vessel are:—Length, 326 ft.; breadth, 47 ft.; and depth moulded, 26 ft. 4¾ in. She is of the improved single-deck type, her deadweight capacity being about 5,500 tons on a light draught, and will be classed 100 A1 at Lloyd's. The steamer is fitted with triple-expansion engines, also built by Messrs. John Readhead & Sons, with cylinders of 24 in., 40 in., and 64 in., with 42 in. stroke, steam being supplied by two large steel boilers, working at a pressure of 166 lbs. The trial was a very successful one, and the vessel attained a speed over the measured mile of 11½ knots. She afterwards proceeded for Cardiff to load for the River Plate.

Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—Ed. M. E.]

INSTITUTION OF NAVAL ARCHITECTS.

To the Editor of The Marine Engineer.

Sir,—One of your contemporaries intends, I believe, issuing a review of the different technical institutions of this country, having already commenced the series, and in view of such publications, I wish to call your attention to the manner in which some applicants for admission to one of the most important of the institutions, viz., the Institution of Naval Architects, are dealt with.

In the summer of 1891 I applied for admission as a member to the above, but, owing to some error in the filling up of the form, in not explaining my experience correctly, and the election being close at hand, I was elected an associate member, with an intimation that I need not take up that rank unless I chose, but could wait until the next election, amend the particulars, and apply for full membership.

This latter is the mode I adopted, and in the spring following sent in a second application, which was rejected for the reason that, although I had been apprentice, workman, and foreman, also superintendent engineer, &c., for three times the required period, I could not shew "that I had been professionally employed as some of them (*i.e.*, engineering and shipbuilding works) as a draughtsman or manager."

I may here state that a member of the Council of the Institution of Naval Architects made an attempt to put me through an examination at a Council meeting of a kindred institute, of which he as well as myself are members of the Council, but as I somewhat peremptorily declined to be catechised he did not persist, and it was after this incident that I was informed I was not considered eligible to be a member of the Institution of Naval Architects.

It is upon the question of the qualification for the membership of this Institution that I desire to be enlightened, and I trust the publication of this letter in your journal may result in myself and other aspirants being so enlightened.

By the printed rules of the Institution, members are exclusively to consist of naval architects and marine engineers conversant with Naval Architecture, and it was under the latter qualification only that I sought admission.

I may here state that my connection with the profession of marine engineering commenced in the year 1860.

Upon examining the list of members of the Institution of Naval Architects, I find many names, the owners of which I am very well acquainted with, some of them for many years. There is one gentleman figuring thereon whose name I am astonished to find, he being a master mariner of the Mercantile Marine, who has never had any particular training, either in naval architecture or marine engineering, and about 16 years ago he was master of a "Tramp" steamer in a line for which I was superintending engineer. This gentleman was originally an associate member, but is now a member, hence my astonishment.

If the Institution of Naval Architects would define their meaning of the words, "professionally engaged," in their bye-laws relating to the election of members, it would, perhaps, lessen trouble and annoyance to intending applicants, who have not been either draughtsmen or managers of shipbuilding or engineering works, but who, with experience as workmen and foremen in such works, also with subsequent experience in the building and maintainance of steam vessels, may, I think, be excused, if they delude themselves with the idea that they are as eligible for membership in the premier Institution as many of their brethren who are already enrolled on its lists.

Yours faithfully,
TRIPLE-EXPANSION.

London, February 15th, 1897.

Reviews.

The "A 1" Shipping Directory and Handbook to Foreign Ports, 1897. London: The "A 1" Shipping Publications Syndicate. 1896.

THE business man is again favoured with a new annual which bids fair to be of great use to him, especially if he belongs to the classes engaged in the shipowning or exporting branches. In the present volume the shipping agents, suppliers of coal and provisions, the engineers and ship repairers, ship chandlers and ship brokers of the world are given under the heads of the separate ports where they carry on their business. Besides their names we are given their telegraphic addresses, if any, and the telegraphic codes which they use, at least in cases where gentlemen have taken the trouble to fill in the circulars sent to them by the compilers, and have so provided their friends and possible customers with much useful and money-saving information. But this information, characteristic of a directory, is not by any means all that the book gives. It tells, also, of the local Consulates and of the agencies of the Shipping Registers. It gives particulars of the usual imports and exports of each port, and of the facilities which will be found there for coaling and replenishing the ship's stock of provisions and water. A great deal about local charges is given, and, further, a description of the port and its anchorage and dock accommodation is furnished The latter accommodation is very complete. There is information as to the conveniences for dealing with great weights and as to the possibility of effecting large repairs. Altogether the book promises to be one of great value to commercial men, and we trust the venture will meet with the encouragement it deserves.

Transformers for Single and Multiple Currents. By Gisbert Kapp. London: Whittaker & Co. 1896.

THIS is another volume of the well-known Specialist Series. It is, as we are told on the title page, translated from the German by the author, who, though resident in Berlin, is a member of the English Institutions of Civil and Electrical Engineers. The book is designed to fill up a gap in the confessedly numerous array of works on electrical engineering. The author believes that an attention to the design and workmanship and working of these appliances will result in increased economy and effectiveness in installations. The book is intended more as a practical guide to the working engineer than as a theoretical explanation for the use of the mathematician, and the mathematical part is consequently kept as much as possible in the background. The author explains the formation of coils and discusses the influences due to their shapes, and he explains the principle of action of the transformer and tells of the construction and usual types of this appliance. He tells too of the symptoms of imperfection and of the method in which to trace and remedy the causes of loss. He teaches his readers how to make tests and to measure power. The volume is full of illustrations and diagrams, and will certainly be of value to those who may be placed in charge of electric machinery.

Screw Threads and the Methods of Producing Them. By Paul M. Hasluck. London: Crosby Lockwood & Co. 1896.

MR. HASLUCK's little waistcoat-pocket volume has now made its appearance in a fourth edition, having been re-written and enlarged. It now contains a good number of diagrams, some of which are, unfortunately, not given their reference numbers. He tells how the screw-cutting lathe is worked, and upon what principles its action is based. He goes very fully, too, into the question of taps and dies and instruments for the testing of the sizes of screws. The different gauges upon which screws are cut, and the different standards prevailing in differnt countries, are all dealt with. The illustrations show how the various objects for which screws are designed are attained by varying the shape and angle of the thread. The booklet is obviously written by one who understands what he is discussing, and we see this in his treatment of the difficulties which present themselves in the management of the lathe, and the way in which he shows how these troubles may be met and overcome.

The Naval Engineer and the Command of the Sea: A Story of Naval Administration. By Francis G. Burton. Manchester: The Technical Publishing Co. 1896.

THERE seems to be a sort of fascination for authors who wish to point out the defects of our naval and military systems to do so by giving a quasi-prophetic account of the operations of the arm under criticism, and showing the methods in which it would show signs of weakness, and eventually break down. But though this method may be a very excellent way of bringing home to the readers of the book the serious position to which they themselves would be brought if war should find this country in a state of unpreparedness, or with preparations made of an unreliable kind, it is not a method which commends itself to the critic. And that for two reasons. The critic, in the first place, has no gift of second sight, and he cannot possibly tell whether these visions will be realised or not. He may even agree with the author in the view that things are wrong now, and yet differ from him as to the ultimate conclusions to which weakness and mismanagement would lead. The second reason why we rather fear the method, is that we never know how far the author invites serious criticism when he is relying on this method. He can always say, "I was only romancing." However that may be, the form has been adopted in the present work, and we must take it as we find it. The period at which the scene of the book is laid is evidently just ahead of the present day, for the vessels spoken of as our finest are the now new first-class battleship *Majestic* and the cruisers *Powerful* and *Terrible*, whilst the French—who are for the purposes of the book assumed to be our enemies—have still the *Carnot* as their finest battleship. The tale is told autobiographically, and at the time of the opening of hostilities the writer is supposed to have been just transferred to the *Terrible*. Very shortly after that there is a general engagement in which the *Sultan* is said to be sunk by a torpedo. Now, here there seems to us to have been an opening for a point, and that point has, unfortunately, not been made. Why select the *Sultan* to be torpedoed? Any modern vessel would have been equally vulnerable to that missile. If a ship had to be sunk occasion might have been taken to teach a lesson, and the cause of her loss might as well have been one which applied peculiarly to a ship of the *Sultan* class. Her weakness is in her old-fashioned guns, and we might have been told how she was destroyed by the rapid fire of less heavily armed but more modern ships with quick-firers, what time her own heavy muzzle-loaders were unworkable, owing to the heavy and continuous fire directed upon her. It may be said that the engineer has no connection with the gunnery department, and that he would leave that entirely on one side. But in the present case the author devotes a very great deal of attention and of space to the question of ordnance. There are pages and pages about the alleged ill-treatment of Mr. Longridge at the hands of the permanent officials of the Departments. If half of what Mr. Burton alleges be capable of proof, Mr. Longridge has not only suffered a very serious injury, but has given the country a very valuable invention and received no recompense but evil from the servants of an ungrateful country. The eighth chapter is devoted to a discussion of the position of the naval artificer and generally of the manning question in the machinery department. The views which are here ventilated are not new. But they are none the worse for that. The lot of the artificers, to whom no career is open, however well they serve their country, is peculiarly hard, and their case is stated with great force and judgment. The difficulties in the way of calling up the Royal Naval Reserve men and the impossibility of letting the merchant marine be denuded of its best workers at a time when it would be especially necessary to bring in supplies, are emphasized. Positions are shown where the calling up the Reserves would inflict positive and unnecessary hardship on men who desire to serve their country, through the existence of certain service conditions. Mr. Burton is impartial, for if the book opens with a conflict with the French it closes with the bombardment of New York. Let us put our readers at once at rest by saying that all ends happily—at least for ourselves. The command of the sea is retained, and the joints in our harness are protected in view of future emergencies. The work is dedicated to Lord Charles Beresford, and he, under the somewhat thin veil of "Admiral Condor," occupies a very heroic and important position in the development of the events. We share Mr. Burton's admiration for Lord Charles and for the work he is doing in convincing the country of the needs of the Navy, and we feel sure that those who read Mr. Burton's book will not only be interested in his romance, but will also agree that there is much room and imperative need for improvement and reform in the arrangements at Whitehall.

Miscellaneous.

Marine Engineers Examination.—At the examination for the honorary certificate of "Extra Chief Engineer," held in January, of the six successful candidates, the second and third places on the list were taken by Mr. C. J. Davidson, of London, and Mr. L. H. MacCallum, of Glasgow. Both these gentlemen were students of Mr. J. Hawthorn, principal of the Engineering Academy, 41, East India Road, London, E., and make 11 successes in this grade from the above establishment.

Institution of Naval Architects.—The annual meetings of this Institution will take place on Wednesday, Thursday, and Friday, April 7th, 8th, and 9th, in the Hall of the Society of Arts, John Street, Adelphi, W.C. (by kind permission of the Council). The Right Hon. the Earl of Hopetoun, G.C.M.G., President, will occupy the chair. The annual dinner will be given on Wednesday, April 7th, at the Grand Hall, Hotel Cecil, Strand, W.C., at 7.15 p.m. Evening dress will be worn.

The Institution of Junior Engineers.—At the last meeting of this Institution, held at the Westminster Palace Hotel, the chairman, Mr. H. Bloomfield Vorley, presiding, an interesting lecture on "Comparisons of Similar Structures, Large and Small," was given by Professor Archibald Barr, D.Sc., of Glasgow, Hon. M.I.J.E. The lecturer first enunciated the general principles regarding the loads which similar structures can bear with like severity of stress, and showed their applications to pistons, cylinders, boilers, beams, bridges, roofs, columns, shafts &c. He then dealt with comparisons of similar structures with respect to rigidity, illustrating them by reference to shafts, beams, bridges, test-specimens, &c. Similar structures with regard to suitability for bearing their own weights, were then treated, and applications to tanks, ships, &c., shown. The influence of size upon the design and proportions of structures was considered and illustrations given from nature. Comparisons of similar objects with respect to their suspension in water and in air formed the next section of the lecture, and in this connection the flying machine problem was investigated. Similar machines with reference to inertia stresses were then compared. At the conclusion of the lecture, on the proposal of Mr B. Boulding, seconded by Mr. E. King, a cordial vote of thanks was passed to Professor Barr.

Stewart's Compositions.—Amongst price lists recently received, is one from Messrs. Robert D. Stewart, Tenter Street West, E., for their paints, colors, oils, &c., and included in this we notice their drilling composition, for use with machines instead of cheap oil, soap, &c. It is claimed by the makers, that the material is always ready, is portable, does not deteriorate, and, a very important point, is free from the offensive smell of the ordinary plan, with which we are familiar in engineering shops. It is mixed with hot water when required for use, in the proportion of 1lb. to 2½ gallons of water. This firm have also an anti-corrosive composition, which is a paste and claimed to be superior to white lead and tallow for the preservation of bright surfaces generally. It is said to be impervious to water, and if we may judge by the list of firms given as having adopted these specialities, they well merit attention.

Tests for Belting Joints.—Messrs. Fleming, Birkby, & Goodall, Limited, of Halifax, have lately issued a very neat little pamphlet on the lacing of driving belts, a trade in which their name is a leading one. From the experiments conducted on 4-in. beltin to test the lacing and the best methods generally of joining up a belt, it was found undoubtedly that punched holes were superior for strength to those slitted with an awl, even though there is less material in the former case to withstand the test. With the punching of five 3-16th holes the net section is only 76 per cent. of the solid belt, while in the second case the section is theoretically the same. Yet unlike what would be perhaps supposed when experimented upon, the belt with the punched holes proved stronger by nearly 50 per cent. the exact figures of the breaking strains being 1,150 and 790 lbs. respectively with single lacing. In another case with a double-laced joint and double rows of holes in each belt, the figures were 2,015 lbs. as against 1,590 lbs. shewing therefore a superiority for the punching of nearly 30 per cent. The pamphlet is illustrated by photos of these belts and their fractures for eleven different trials, and forms a very interesting collection of results for those interested.

Vulcanized Fibre.—We have received a sample of the patent vulcanized fibre manufactured by the well-known firm of Messrs. Mosses & Mitchell, of Chiswell Street. Hitherto this fibre has been made as far as we know, of a terra-cotta tint, but the sample before us is of a stone colour or as it is called in the price list, white. Presumably from the quotation it is of a better quality than the usual red, and this leads us to note what a great use this class of goods has been put to since its first introduction to take the place of india-rubber. We are informed that for air and circulating pumps, they are in use in over 7,000 steamships, while for condenser ferrules they have been tried for 17 years. In the latter case the material has taken the place of wood and prevents leakage from its power of expansion when wet, and so making a good tight fit at all times. It is claimed by the makers to last as long as the condenser without renewal.

Incombustible Plates for Warships.—The *Italia Militare* states that an Italian firm has made a number of experiments regarding uninflammable materials which it intends to employ in construction of warships, to prevent conflagrations caused by projectiles. The first experiments have been quite successful, and a report to the Naval Minister decides for new experiments at the arsenal of Spezzia. After these new experiments the fire-proof plates of the firm in question will be officially adopted.

NEW WHITE STAR MAIL STEAMER.

THAT there is no such thing as finality in modern shipbuilding is strikingly evidenced in the announcement that Messrs. Ismay, Imrie & Co. have arranged with Messrs. Harland & Wolff, of Belfast, for the construction of a new and very remarkable addition to the White Star fleet of Atlantic liners. This steamer will exceed in length by 65 ft. any vessel either afloat or in course of construction. Nor will her claim to distinction stop at this point, she will break the world's record for length, which hitherto has been held by the *Great Eastern*. The *Great Eastern* was 679 ft. in length; the *Oceanic* will be 704 ft., or 5 ft. longer, and her gross tonnage will exceed 17,000 tons.

In the construction of the new vessel the White Star Co. adhere steadily to the principles which they have followed with such signal success during the whole of their career. Due attention will be given to the matter of speed, but extreme speed will be subordinated to the comfort and convenience of passengers of all classes; and in her internal arrangements the new vessel will be an enlarged reproduction of the *Teutonic* and *Majestic*, except in so far as improvements may have suggested themselves in the size and fittings of the rooms, and which may be rendered practicable by the increased dimensions of the ship herself.

Upon the question of speed the Company announce that although a much higher sea-speed than that now contemplated is quite practicable from an engineering point of view, it has been determined as far as possible to aim at a regular Wednesday morning arrival, both in New York and in Liverpool, making the Irish land and Queenstown by daylight, and enabling passengers who may be travelling to places beyond the port of arrival to proceed to, and in the majority of cases reach their destinations with comfort during the day.

It is expected that the new *Oceanic* will be launched in January next. Her advent will undoubtedly be regarded with interest, not only from a commercial, but also from a naval point of view, as a valuable addition to the nation's fleet of mercantile armed cruisers, which contains at this moment only four vessels with twin screws (of which two are the White Star steamers *Teutonic* and *Majestic*), fulfilling all the Admiralty requirements, and capable of maintaining a sea-speed of 20 knots or over; whilst the United States and Germany, thanks to the fostering care of their Governments, and the liberal subsidies allowed, can with just pride enumerate between them no less than eight such steamships afloat, with others larger and faster in course of construction. The new White Star liner will be able to transport a large body of troops with stores and ammunition to the most distant points with ease and unusual rapidity, while in the matter of coal endurance it will be noted that her powers are to be most exceptional, inasmuch as after making liberal allowance for the weights of stores, ammunition and troops, this steamer will be able to steam in case of need, 23,400 knots at 12 knots per hour, or practically round the world without coaling.

The new steamer will be named the *Oceanic*, after the pioneer vessel of the company, which has recently been withdrawn after a most successful career of over a quarter of a century, and in the construction and arrangements of which were introduced for the first time many improvements, then regarded as luxuries, which the traveller of to-day takes as a matter of course, and as essential to comfort in ocean travel.

With the construction of the new *Oceanic*, a chapter of additional interest is added to the history of the White Star Line. For a number of years its fleet consisted of sailing ships engaged in the Colonial trade, and many persons now well established in Australia have been safely carried across the ocean under its flag. As time passed, however, a change took place, and in the comparatively short period of five years from 1870 to 1874 the steamships *Oceanic*, *Baltic*, *Republic*, *Celtic*, *Adriatic*, *Britannic*, and *Germanic* were introduced by the company into the Liverpool and New York trade, and the lead thus obtained by means of these vessels was so strong that it was not until the year 1889 that the company keeping in view the comfort and convenience of passengers rather than the attainment of the highest rate of speed, brought out the twin-screw steamer *Teutonic*, and a year later her sister the *Majestic*. These two vessels together with the *Britannic* and *Germanic*, have since performed with regularity the midweek mail service from Queenstown to New York, and their popularity with the travelling public has been unmistakable. The *Germanic*, which was re-engined and renovated in 1895, has more than maintained her early record, and the *Britannic*, after 22 years of continuous service, during which she has travelled no less than 1,500,000 miles with her original engines and boilers, made her fastest voyage of 7 days 7 hours to New York in the month of August, 1896.

It is well known that all the steamers of the fleet have been built by Messrs. Harland & Wolff, of Belfast. The tonnage hitherto turned out from their famous yard for the White Star Line reaches a total of 155,195 tons; and the same builders have now in hand new steamers for the same company, amounting to no less than 103,885 tons. The capital expenditure of which Belfast has thus enjoyed the benefit, represents the striking total of over five millions sterling.

Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships, from January 8th. to February 9th, 1897.

529 S. M. S. Turner and H. Austin. Steam engines.
568 E. C. F. James. Folding boats.
572 S. O. Cowper-Coles. Engines.
606 T. C. Sargeant. Steam boiler.
608 D. B. Morison. Condensers.
643 C. Macdonald. Furnace bars.
697 C. W. A. Taylor. Lubricator.
708 P. F. Maccalum. Engines.
737 J. Savelsberg. Steam generators.
752 W. H. Newman. Boilers.
768 H. A. Fedde. Propelling boats.
789 E. G. Guyot. Water-tube boilers.
813 A. E. Hawks and S. Barner. Sight-feed apparatus.
825 L. M. G. Delaunay-Belleville. Steam generators.
863 W. P. Thompson (W. L. McCabe and C. H. Anderson, United States). Loading vessels.
879 J. W. Helps. Water-level indicators.
897 Baron A. B. Gallo. Roller ships.

898 H. J. Roberts. Feed regulator.
944 J. L. Grandison. Lubricators.
958 C. P. Backstrom. Deep sea sounding apparatus.
967 A. F. Yarrow. Shallow draught vessels.
1000 J. P. Ronge and E. M. Robinson. Water gauge.
1012 J. Thomas. Reducing friction in bearings.
1022 A. W. Davidson, A. Duthie, and R. B. Stewart. Screw propellers.
1052 W. W. McGwire. Life-boats.
1077 C. C. Wakefield. Gauge glass fittings.
1140 F.J. Lothammer. Steam generators.
1185 J. Phillips. Cowls.
1205 F. H. Wilson. Lifebuoys.
1236 W. S. Simpson. Cylinders.
1262 W. Shearman. Furnace grates.
1278 O. M. Olsen. Paddle steamer.
1296 A. D. Homard. Lubricators.
1307 J. and G. West, and H. J. W. Raphael. Boilers.
1329 H. See. Boilers.
1330 H. H. Lake (G. W. Brown, United States). Stopping engines.
1340 J. A. Romer and H. H. Perkes. Steam generators.
1347 F Clench and T. S. King. Tubes.
1348 G. McD. Clench and T. S. King. Shaft governors.
1349 G. McD. Clench and T. S. King. Valves.
1350 F. Clench and T S. King. Removable furnace.
1353 F. Clench and T S. King. Boilers.
1371 H. B. Watson, J. S. Watson, and J. Patterson. Steam distributing valves.
1372 W. Chadburn. Communicating in ships.
1380 S. A. and J. E. Croft. Motor for utilising the rise and fall of the tide.
1389 F. Bamford and W. Wadsworth. Furnaces.

BOARD OF TRADE EXAMINATIONS.

Extra First Class.

January 23rd, 1897.	Brown, J. M.	Ex. 1C	N.Shields
,, ,, ,,	Davidson, C. J. ..	Ex. 1C	London
,, ,, ,,	MacCallum, L. H.	Ex. 1C	,,
,, ,, ,,	Smith, H. G.......	Ex. 1C	Hull
,, ,, ,,	Wilson, J. F......	Ex. 1C	Sunderland
,, ,, ,,	Wokes, C.	Ex. 1C	Hull

Note.—1C denotes First Class; 2C, Second Class.

January 23rd, 1897.

Abbott, T. H. ..	1C	W.H'pool
Adair, W......	1C	Glasgow
Anderson, J....	2C	S'ham'ton
Balharrie, D. L.	1C	Dundee
Bateman, R. W.	2C	W.H'pool
Brooks, W. B...	1C	,,
Colbron, J. A. ..	1C	London
Coles, F.........	1C	,,
Dale, G.........	2C	Glasgow
Davie, J. A.....	2C	London
Davies, T. J....	1C	Cardiff
Dawson, O.	2C	N.Shields
Dewar, H. R. ..	1C	London
Dixon, J. D.....	2C	,,
Evans, T. H....	1C	W.H'pool
Flockhart, R. ..	1C	,,
Gillanders, Wm.	1C	Aberdeen
Gillings, W. L. .	1C	W.H'pool
Hastilow, A. H.	2C	N.Shields
Hill, F.........	1C	Cardiff
Jackson, H. R. .	2C	Liverpool
Jeffrey, J. G. H.	2C	N.Shields
Johnson, R. H. .	1C	W.H'pool
Kingston, R. ..	2C	,,
Levins, A.	1C	Glasgow
McInroy, A.....	2C	,,
Miller, Peter J.S.	2C	Liverpool
Morgan, W. L...	2C	Cardiff
Mundie, R.	2C	Glasgow
Norris, S. H. ..	2C	London
Parker, R. G. ..	2C	W.H'pool
Pascoe, George .	2C	Liverpool
Paterson, J.....	1C	Glasgow
Prentice, E.E.R.	2C	W.H'pool
Price, F. J.	1C	Cardiff
Quack, Emil A.	2C	Liverpool
Reid, W.	1C	Dundee
Sinton, J.......	2C	Liverpool
Smallwood, R..	2C	W.H'pool
Stephens, A.E.P.	2C	,,
Stewart, C. B...	2C	S'ham'ton
Taylor, A. W.A.	2C	Liverpool
Tone, C. W.	2C	London
Wake, C. F.....	1C	W.H'pool
Williams, J. E..	1C	Cardiff
Wood, R. W....	2C	London

January 30th, 1897.

Baxter, Daniel .	1C	Liverpool
Carefull, Harry	1C	,,
Fisher, Thos. H.	2C	,,
Greenhaigh, G.T.	1C	,,
Harrison, T. D.	2C	S'nd'land
Ingram, H. J...	2C	,,
Jones, A.	1C	Aberdeen
Jones, Wm. T..	2C	Liverpool
Lloyd-Williams.	1C	,,
Lowes, J. A....	1C	S'nd'land
Nolan, J.	2C	,,
Palmer, J. W..	1C	,,
Scott, W.	1C	Aberdeen
Sharp, John H.	1C	Liverpool
Stephenson, T..	1C	S'nd'land
Taylor, V. O. G.	1C	Liverpool
Wilson, James..	1C	,,

February 6th, 1897.

Bain, C. W.....	2C	Glasgow
Bennett, P. C...	2C	London
Bruce, T.	2C	,,
Clarke, Robert	2C	Liverpool
Cockburn, A. ..	2C	,,
Colliat, J.......	2C	N.Shields
Colquhoun, W.	2C	Glasgow
Death, C.	2C	London
Denholm, J. ..	2C	N.Shields
Evans, J. H. ..	2C	Cardiff
Flores, H.	2C	N.Shields
Gill, H. McD...	2C	,,
Griffiths, A. G..	2C	Cardiff
Hedworth, J. ..	1C	N.Shields
Houston, A. C..	2C	Glasgow
Jenks, F. O.....	2C	Cardiff
Johnson G. H.	1C	N.Shields
Jones, D.	1C	Cardiff
Leader, E. A. ..	1C	,,
Lee, M. W.	1C	N.Shields
Lennox, A.	2C	Glasgow
Loughran, Jos..	1C	Liverpool
MacGregor, J...	2C	Glasgow
Marshall, Henry	2C	Liverpool
Marrs, William	2C	Belfast
McCall, W. G...	2C	Glasgow
McColl, D.	2C	,,
McMenemy, J..	2C	N.Shields
Millar, G.......	1C	Glasgow
Moore, Robert..	1C	Liverpool
Myers, J. G.....	1C	N.Shields
Nicolson, W. ..	1C	Glasgow
Paterson, J.....	1C	,,
Richards, R. J.	1C	Cardiff
Robertson, N. .	1C	Glasgow
Roffey, Chas. E.	1C	Liverpool
Rosser, W.	2C	Cardiff
Shirlaw, J. R...	1C	London
Slater, G.......	1C	N.Shields
Smith, W.	1C	London
Soldat, S. G. ..	2C	Liverpool
Stephens, D. G.	2C	Cardiff
Stewart, W. C..	2C	Glasgow
Thomas, H. O..	2C	Liverpool
Tolman, J. A...	2C	,,
Wallace, J. M. J.	1C	London
Walton, E. J. ..	2C	,,
Weddell, G. Y..	2C	N.Shields
Wilson, G. W...	2C	Cardiff
Winter, C.	1C	,,

February 13th, 1897.

Anderson, H. A.	2C	Liverpool
Blair, J.	2C	Greenock
Bowie, A. L.....	2C	,,
Bowman, R. S..	1C	N.Shields
Boyd, D. M. ..	2C	Greenock
Bunting, T. S...	2C	N.Shields
Carr, A.	1C	Greenock
Cunningham, W.	2C	,,
Dempster, R. ..	2C	,,
Dixon, C. H. ..	2C	London
Dodds, A.......	1C	N.Shields
Duncan, Charles	2C	Liverpool
Duncanson, J.H.	1C	Leith
Dunn, A.	2C	N.Shields
Edmonds, R. M.	2C	Dublin
Farr, G. O.	1C	London
Forbes, J.......	2C	Leith
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Gardner, T.....	2C	,,
Gourlay, J. S...	1C	Greenock
Harris, P.	2C	Greenock
Harrison, N. ..	2C	Liverpool
Hornby, W. E.	1C	Hull
Innes, P.	2C	Greenock
Keig, John T. ..	2C	Liverpool
Keymer, A. E.	1C	London
Late, W. W.....	1C	London
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Malcolm, A. F.	1C	Leith
Masson, J. C. ..	2C	N.Shields
Mercer, W. ...	2C	London
Mulhern, J. A..	2C	Greenock
Osborne, W. F.	1C	Leith
Paterson, A. ..	2C	Leith
Pullen, O. W. J.	2C	Liverpool
Purvis, J.......	2C	N.Shields
Purvis, J. E. ..	2C	,,
Robertson, C. ..	2C	Leith
Rutherford, R.T.	2C	N.Shields
Ryder, A. H. ..	2C	Liverpool
Scott, Alexander	1C	,,
Scott, D.	2C	Dublin
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Shearer, John ..	2C	Liverpool
Sleight, J. W. ..	2C	Hull
Taylor, J. C. ..	1C	London
Weber, A.......	2C	Greenock
Wheatley, T. E.	2C	Dublin

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Athey, W. T....	1C	N.Shields
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Bisset, John R..	1C	Liverpool
Bradley, Joseph	1C	,,
Buchanan, T. J.	1C	Glasgow
Cawrse, E......	1C	W.H'pool
Christie, W....	1C	,,
Clark, A.	2C	,,
Cocker, E. J....	1C	Liverpool
Cornish, R.	2C	Glasgow
Cowan, Joseph .	1C	Liverpool
Crocker, G. H..	2C	Cardiff
Davies, John E.	2C	Liverpool
Dryburgh, A. ..	1C	W.H'pool
Exton, E. A....	1C	,,
Fraser, C......	2C	Cardiff
Fulton, E......	2C	W.H'pool
Fulton, J......	2C	Glasgow
Glover, Alex. G.	1C	S'ham'ton
Gordon, C. F...	2C	Glasgow
Heaton, John..	2C	Liverpool
Hedley, W. L...	2C	N.Shields
Henry, James G.	2C	Dundee
Herman, A.V.E.	2C	Cardiff
Hogg, J. W....	1C	W.H'pool
Houston, H. E.	1C	Cardiff
Jones, W. J....	2C	,,
Kitching, T....	2C	W.H'pool
MacDonald, F...	1C	London
Martin, D. E...	2C	Glasgow
McKay, D......	1C	,,
Meldrum, J....	1C	N.Shields
Morgan, J......	2C	Glasgow
Murphy, M. F.	2C	Liverpool
Murphy, R. H.	2C	,,
Naylor, William	2C	,,
Newey, S. E....	2C	Cardiff
Rae, J. S.......	2C	Glasgow
Reed, J........	2C	W.H'pool
Richardson, C..	2C	N.Shields
Rooker, P. W..	2C	Liverpool
Rowland, E....	1C	W.H'pool
Smith, J.	2C	Glasgow
Stevenson, A.M.	1C	London
Stewart, Wm.H.	2C	Liverpool
Swan, Arthur F.	2C	,,
Tate, W. S....	2C	W.H'pool
Thistlethwaite A.	2C	N.Shields
Tredinnick, T.L.	2C	Cardiff
Tresidder, J. V.	2C	,,
Tucker, W. T..	2C	N.Shields
Tunnicliff, G. F.	2C	W.H'pool
Walker, J......	1C	,,
Wilson, R......	2C	,,
Woodward, E.W.	1C	,,

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